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MEMOIRS

OF THE

CALEDONIAN

HORTICULTURAL SOCIETY.

VOLUME SECOND.

——— Deus nobis hæc otia fecit.

.....

Insere nunc, Melibœe, Pyros; pone ordine Vites.

Virg.

EDINBURGH:

PRINTED BY NEILL & CO.

FOR ARCHIBALD CONSTABLE AND COMPANY, EDINBURGH,

AND LONGMAN, HURST, REES, ORME AND BROWN,

LONDON.

1818.

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LIST

LIST OF MEMBERS

OF THE

CALEDONIAN

HORTICULTURAL SOCIETY.

January 1815.

HONORARY.

Elected December 5. 1809.

His Grace the Duke of Buccleuch and Queensberry.
The Right Hon. the Earl of Wemyss.
The Right Hon. Lord Gray, Kinfauns.
The Hon. Henry Erskine, Ammondell.
The Right Hon. Sir John Sinclair, Bart.
Sir John Hope, Bart. of Pinkie.
Sir William Forbes, of Craigievar, Bart.
Francis Garden Campbell, Esq. of Troup.
George Skene, Esq. of Skene and Carriston.
The Right Hon. Sir J. Banks, Bart. P. R. S. Lond.
Richard Anthony Salisbury, Esq. London.
Thomas Andrew Knight, Esq. London.

March 6. 1810.

The Right Hon. the Earl of Leven and Melville.
The Right Hon. the Earl of Kintore.
The Right Hon. Lord Ruthven.
The Hon. William Maule of Panmure.
Sir James Gordon, Bart. Letterfourie.
Dr Alexander Monro *senior*.
Alexander Munro, Esq.
David Black, Esq. of Bandrum, Dunfermline.
William Wemyss, Esq. of Wemyss-Castle, M. P.
Adam Rolland, Esq. Advocate.
Charles Christie, Esq. of Durie.
Dr Andrew Graham.
Dr Walter Graham.

December 4. 1810.

The Hon. Douglas Gordon Halyburton, of Pitcur.

March 5. 1811.

The Right Hon. Lord Viscount Duncan.

June 5. 1811.

Lieutenant-Colonel Wemyss, of Wemyss-Hall.
General Durham of Largo.
Sir Simon Clark, Bart. of Oakhill.
Sir George Buchan Hepburn, Bart. of Smeaton.

September 3. 1811.

George Dempster of Dunnichen, Esq.
John Deas Thomson, Esq. London.

March 10. 1812.

William Rae, Esq. of St Catherine's.

June 9. 1812.

The Most Noble the Marquis of Queensberry.

December 14. 1813.

Dr John Cockly Lettsom, Physician, London.

March 8. 1814.

Sir Gilbert Blane, Bart. M. D. London.

J. C. Curwen, Esq. Worthington Hall.

December 13. 1814.

Sir James Wylie, M. D.
Dr Crichton *senior*,
Dr Crichton *junior*,
} Physicians to the Emperor of Russia.

Professor Smith of Christiana, Norway. 43

N. B.—By a late regulation respecting the admission of Members, it has been enacted, That the rank of Honorary Member shall be entirely confined to distinguished amateurs of Horticulture who do not reside in Scotland.—Several of those who were once in the Honorary list, (Lord Torphichen, Sir James Hall, Sir George Mackenzie, and others,) have, at their own desire, been transferred to the Ordinary list, that they might be called upon to give an annual contribution for promoting Horticulture in Scotland.

ORDINARY.

Elected December 5. 1809.

The Right Hon. Lord Torphichen.
Sir James Hall, Bart. of Dunglass, P. R. S. E.
Sir George Stuart Mackenzie, Bart. of Coul.
James Hare, Esq. of Calderhall.
Dr Andrew Duncan *senior.*
Dr James Home.
Dr Daniel Rutherford.
Dr Andrew Coventry.
Right Hon. Robert Liston of Millburn-Tower.
John Dundas, Esq. W. S.
George Bruce, Esq. of Langlee.
James Smith, Esq. Leith.
Mr Walter Dickson.
— Thomas Dickson.
— Andrew Dickson.
— Alexander Henderson.
— Thomas Shade.
— James Macdonald, Dalkeith Park.
— John Hay.
— John Fletcher.
— Edward Sang, Kirkcaldy.
— Patrick Neill.
— Charles Norval, Abbot's Hall.

March 6. 1810.

James Gibson, Esq. of Ingliston, W. S.
William Pagan, Esq. of Spittleton.
David Falconer, Esq. of Carlourie.
Alexander Keith, Esq. of Ravelstone.
James Heriot, Esq. of Ramornie.
Henry Jardine, Esq. W. S.

Henry Johnston, Esq.
James Weddell, Esq. younger of Pittendreich.
James Kyd, Esq. Cupar-Fife.
John Fergusson, Esq. of Stronvar.
Rear-Admiral David Milne, Inveresk.
Robert Little Gilmour, Esq. W. S.
Robert Wilson, Esq.
Walter Berry, Esq.
George Fulton, Esq.
Mr James Dickson.
— George Dickson.
— James Smith, Ormiston-Hall.
— Thomas Handyside, Fisherrow.
— George Whittit, Barnton.

December 4. 1810.

Robert Speirs, Esq. of Duninald.
Archibald Mackinlay, Esq.
Mr George Watson, jeweller.
Mr William Shiells, Dalkeith.

March 5. 1811.

Hugh Watson, Esq. W. S.
Charles More. Esq.

June 5. 1811.

Duncan Cowan, Esq.
J. A. Higgins of Neuck, Esq. W. S.
John Macfarlane, Esq. of Kirkton.
Dr John Yule.

September 3. 1811.

Robert Ferguson of Raith, Esq.
Gilbert Laing Meason of Lindertis, Esq.
Robert Bruce Dundas of Blair, Esq.
George Bell, Esq.
John Thomson, Esq.

James Stuart, Esq. younger of Dunearn, W. S.
William Inglis, Esq. of Middleton, W. S.
J. W. Brougham, Esq.
David Bridges *junior*, Esq.
William Cadell *junior*, Esq. Banton.
David Balfour, Esq. Arbroath.
Robert Stewart Cumming, Esq. Dalkeith.
Colonel Thomas Calderwood of Polton.

December 3. 1811.

John Maitland of Eccles, Esq.
Alexander Young of Harburn, Esq.
William Braidwood *junior*, Esq.
James Carfrae, Esq.

March 10. 1812.

Sir John Hamilton Dalrymple, Bart. of Cousland.
Dr Meiklejohn, Professor of Church History, Edin.
The Rev. Leslie Moodie, Inveresk.
Francis Anderson, Esq. of Stonyhill.
Alexander Cowan, Esq.
Robert Dundas, Esq. W. S.
Thomas Guthrie Wright, Esq. W. S.
Thomas Hopkirk, Esq. Dalbeth.
Samuel Paterson, Esq. of Lindsey-Lands.
James Bell, Esq. merchant, Leith.
Robert Morton, Esq.

June 9. 1812.

The Rev. Dr Walter Fogo Ireland, North Leith.
Colonel Spens of Craigsanquhar.
Captain John Burn, R. N.
Alexander Liston Ramage, Esq. W. S.
Archibald Constable, Esq.
Mr Peter Lawson.
— Peter Leyden, Dalkeith.
— John Grieve.

Mr James Campbell, Dalry.
— James Clarkson, Cloniard, Ayrshire.

September 8. 1812.

The Rev. Dr Laurence Adamson, Cupar-Fife.
Francis Balfour, Esq. of Fernie.
James Bryce, Esq.
George Gardner, Esq.
William Henderson, Esq.
Mr Alexander Wright, Edinburgh.

December 8. 1812.

The Hon. George Abercromby of Tullibody.
John Rutherford, Esq. of Edgerston.
Dr James Hare *junior*.
Frederick Fotheringham, Esq. Commissioner of Excise.
John Borthwick Gilchrist, Esq.
James Millar, Esq. advocate.
Dr William Farquharson.
Alexander Henderson, Esq. of Warriston, Banker.
Robert Smith, Esq. merchant.
Robert Johnston, Esq.
Mr James Scott, surgeon, 8th R. V. B.
Mr Henry Scott.
Roger Aytoun, Esq. W. S.
Mr Thomas Lowrie, at Inverleith.
Lieut.-Colonel Oliphant of Rossie, Perth.
Thomas Trotter, Esq. of Blackford.
Thomas Junor, Esq.
George Wood, Esq.
William Creelman, Esq. of Coats, Meadowfield.
John Reid, Esq. merchant, Leith.
Mr Graham Thomson, London.
— George Kincaid.
— Charles Ritchie.

Mr Thomas Crichton, Lauriston.
— John Macnaughton, Edmonstone.
— William Nash, London.
— John Cormack, London.

March 9. 1813.

Henry Erskine, Esq. younger of Ammondell.
John Wauchope, Esq. of Edmonstone.
Gilbert Innes, Esq. of Stow.
Dr Andrew Duncan *junior*.
Robert Stevenson, Esq. civil engineer.
George Reid, Esq. Ratho-Bank.
William Macknight Crawford, Esq. of Ratho House.
Major Weir, Drumsheugh.
James Wyld, Esq. Leith.
John Anstruther, Esq. of Airdit.
Alexander Shaw, Esq.
Mr William Forbes, Town Record Office.
Mr William Gib, Advocate's Library.
Robert Edmonds, Esq. London.
Francis Howden, Esq. jeweller.
Mr John Leslie.

June 8. 1813.

James Howison, Esq. Hillend.
George Burnet, Esq.
James Harvie, Esq. of Brownlee.
David Stewart, Esq. of the Customs.
Mr William Gillespie, Broughton.
Mr James Gray *junior*, nurseryman, London.
Mr Robert Hogg, nurseryman, Dunse.
John Govan, Esq. W. S.

September 14. 1813.

Charles Stirling, Esq. of Kenmure.
Thomas Bell, Esq. Parkside.
Professor George Dunbar.

Mr Wauchope, Esq. merchant, Leith.
— William Aitchieson, jeweller.
— Edward Irvine, Leith.
— Thomas Lowe, Dalry.
— A. S. Porterfield, at St Bernard's, Edinburgh.

December 14. 1813.

J. Glassford Hopkirk, Esq. W. S. Edinburgh.
John Pitcairn, Esq. younger of Pitcairn.
Dr Gillespie, Leith.
Mr Hugh Ronalds *junior*, London.
John Scott, Esq. merchant, Leith.
John Paul, Esq. merchant, Leith.
John Linning, Esq.
Joseph Gordon, Esq. W. S.
Mr James Milne.
Thomas Deucher, Esq. Shielhill, Forfar.
Lieut.-Col. H. V. White of Kaimshill.
Mr John Couper, Dalmeny.
Francis Naldar, Esq. Belleville.

March 8. 1814.

Sir Robert Preston, Bart. of Valleyfield.
Sir Patrick Walker.
Dr Thomas Charles Hope.
John Archibald Campbell, Esq. W. S.
Charles Stewart, Esq. of Dalguise.
Robert Burn, Esq.
Alexander Macartney, Esq. Commercial Bank.
James Marshall, Esq. Bank of Scotland.
Mr David Niven.
Mr John Fair, London.

June 14. 1814.

John Corse Scott, Esq. of Sinton.
James Stewart, Esq. merchant, Leith.
James Scott, Esq. *Stius.*

William Taylor, Esq. Queensferry.
Henry Junor, Esq. merchant, Leith.
John Ballantyne, Esq.
William Boyd, Esq. of Hillhouse.
Michael Meek, Esq. Sober Northallerton.
Mr Walter Hay.

September 13. 1814.

William Anderson, Esq. Wester Colinton.
Francis Grant, Esq. Kilgraston.
George Mitchell, Esq. Parson's Green.
Rev. Dr Alexander Brunton.
Andrew Weddel, Esq. Leith Links.
William Trotter, Esq.
Francis Jeffrey, Esq. advocate.
Henry Cockburn, Esq. advocate.
John A. Murray, Esq. advocate.
John Lauder, Esq. merchant.
R. B. Blyth, Esq. merchant.
Rev. John Thomson, Duddingstone.
James Gray, Esq. St Leonard's Rock.
James Wilson, Esq.
Mr Thomas Gemmel, Kilmarnock.
William Brown, Esq. Bowershall, Leith.

December 13. 1814.

The Right Hon. Lord Elibank.
Robert Jameson, Esq. Prof. Nat. Hist. Edin.
Dr James Hamilton *junior*, Prof. of Midwifery, Edin.
Alexander Hutchison, Esq. merchant.
James Ferguson, Esq. Advocate.
James Alexander Stewart, Esq. Glasserton.
William Gilchrist, Esq. merchant.
John Leven, Esq. W. S.
H. Macdonald Buchanan, Esq. Principal Clerk of Session.
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CORRESPONDING.

Elected December 5. 1809.

Mr Robert Anderson, Hamilton Palace.
— James Smith, Keith Hall, Kintore.
— Robert Hosie, Lynedock, Perth.
— John Mitchell, Moncrieff House.
— Alexander Muirhead, Invermay.
— Thomas Bishop, Methven.
— John Macmurray, London.
— Alexander Dods, Clerkington, Haddington.
— Alexander Macdonald, Durie.
— James Nisbet, St Mary's Isle.
— Thomas Henderson, Blair-Adam.
— James Austin, Glasgow.
— George Rutherford, Newcastle.
— James Bain, Dysart.
— James Kirk, Smeaton, Prestonkirk.
— William Beattie, Scone.
— John Henderson, Brechin.
— William Ballantyne, Dalkeith.
— Thomas Thomson, Wemyss-Castle.
— Joseph Archibald, Dalhousie Castle.
— Thomas Thomson, Erskine House.
— James Dods, Bargany, Girvan.
— John Mackintosh, Abercairney.
— George Lamb, Tonguehall, Leeds.
John Shirreff, Esq. Drummore.

March 6. 1810.

Rev. Dr John Stuart, Luss.
Rev. Dr John Fleming, Flisk.
James Hoy, Esq. Gordon-Castle.

Mr David Weighton, Melville House.
— James T. Mackay, Botanic Garden, Dublin.
— James Laing, New Tarbet, Parkhill.
— James Rintoul, Coilsfield.
— William Dickson, Arniston.
— James Stewart, Pinkie House.
— Alexander Stewart, Valleyfield.
— Peter Barnet, Logiealmond.
— Daniel Crichton, Minto House.
— John Naismyth, Culloden House.

December 4. 1810.

Mr David Ford, Tyningham.
— Thomas Torrance, Shambally, Ireland.
— John Gibb, Linton, Prestonkirk.

March 5. 1811.

Mr Robert Ingram, Torry.
— Walter Underwood, Eglintoun-Castle.
— George Steel, Lundie House.
— James Buchanan, Camberwell.
— William Affleck, Hirsel.

June 5. 1811.

Mr William Gibbs, Inverness.

September 3. 1811.

Mr William Emslie, Adniston.
— William Urquhart, Dundee.
— Picken, Kirkhille.
— William Brownlee, Dalkeith.
— James Lawrie, Spittleton.

December 3. 1811.

Mr James Brown, Perth.
— Robert Brown, Perth.
— William Macnab, Botanic Garden, Edinburgh.

Mr George Sinclair, Woburn Abbey.
— Robert Blair, Stevenstone.
— George Ogilvie, Prestonhall.
— John Macdougall, Castle-Huntly.
— Robert Fairbairn, Stitchel.
— Alexander Hay, Binns.

March 10. 1812.

Mr James Patterson *jun.* Wishaw.
— George Guthrie, Gowkscroft.
— David Creddie, Gatehouse of Fleet.
— Duncan Montgomery, Buchanan.
— William Menzies, Meikleour.
— James Pace, Boquhan.
— John Kyle, Keir.
— Thomas Barton, Bothwell Castle.
— William Knox, Elderslie.
— John Machray, Errol.
— Archibald Gorrie, Rait.
— James Scougall, Cupar-Fife.

June 9. 1812.

Mr William Don, Botanic Garden, Hull.
— David Trotter, Alva.
— William Ramage, Callyhouse.
— Thomas Petrie, Coney Park.
— Andrew Murray, Harviston.
— James Hardie, Kailzie.
— John Wanless, Montwhannie.
— John Neilson, Penicuik House.
— Thomas Richardson, Redheugh.
— William Irvine, Capheaton.
— Thomas Blair, Belfast.
— James Allan, Collinton.

Mr William Allan, Marchmont House.
— Thomas Clarkson, Ireland.
— John Morrison, Stranraer.

September 8. 1812.

Mr William Air, Coldstream.
— Alexander Gibson, Inchry.

December 8. 1812.

Collector Lorimer, Dunbar.
Mr Burnet, Viewfield, Dunbar.
Rev. Andrew Small, Auchtermuchty.
Mr William Affleck, Duddingston Cottage.
— William Crawford, North Park.
— John Liddel, Ardgowan.
— William Bull, Drimmies.

March 9. 1813.

Dr John Macculloch, Woolwich.
Rev. John Black, Innerkeilor.
Mr John Wood.
— Joseph Smeall, Millburn-Tower.
— Duncan Robertson, Megginch-Castle.
— John Campbell, Kinfauns.
— John Dick, Ballendean.
— John Maxton, Kirktonhill.
— John Tweedie, Sundrum.

June 8. 1813.

Mr Archibald Duncan, Hope Temple.
— John Middleton, Tillychewen.
— Alexander Smith, Grangemuir.
— J. Ross, Dunkeld.

September 14. 1813.

Mr John Easton, Weens.
— James Laird, Portmore.
— John Young, Belmont-Castle.
— John Kinment, Murie.

December 14. 1813.

Mr George Sanders, Gordon Castle.
— Alexander Falconer, Drumtochty Castle.
— James Miller, Dupplin.
— Robert Warrix, Fasque Castle.
— James Walker Melville Castle.
— David Macewan, Dunglas.
— Donald Fraser, Inverness.
— Peter Fraser, Inverness.
— William Wales, Fetteresso Castle.

March 8. 1814.

Rev. Dr Anthony Dow, Kilspindie.
Mr George Munro, Dunse Castle.
— Roderick Forbes, Fleurs.
— John Brown, Dunbar House,
— John Taylor, Dunmore Park.
— George Shiells, Oxenford Castle.
— John Aiton, Archerfield.
— John Blackie, Calder House.

September 13. 1814.

Mr Robert Murray, Kilkerran.
— James Aitken, Dunbarton.
— Alexander Meek, Dunbarton.

December 13. 1814.

Mr John Stewart, Cullen House.
— Alexander Smith, Pitfour.
— James Falconer, Cambo House.
— William Ingram, Pitmilly.
— George Clark, Glenbervie.
— Alexander Murdoch, Huntly Lodge.
— William Chalmers, Vogrie.

Mr John Begbie, Rossie Castle.
— William Reid, Lees, Coldstream.
— George Fraser, Coul, Ross-shire. 145
— James Paterson, Moredun.
— James Henderson, Dunottar.
— George Pattison, Invergordon. 148

OFFICE-BEARERS

For the year 1815.

His Grace the Duke of BUCCLEUCH and QUEENSBERRY,
President.

Earl of LEVEN,
LORD TORPHICHEN,
Dr RUTHERFORD,
Dr DUNCAN *senior*,
} *Vice-Presidents.*

Mr THOMAS DICKSON,
Mr PATRICK NEILL,
} *Secretaries.*

Mr ANDREW DICKSON,—*Treasurer.*

COUNSELLORS.

Professional.	*Amateur.*
Mr John Hay.	Henry Jardine, Esq.
Mr Alexander Henderson.	James Heriot, Esq.
Mr George Whittit.	John Thomson, Esq.
Mr J. Smith, Ormiston.	George Bell, Esq.
Mr Charles Norval.	Gilbert Innes, Esq.
Mr James Macdonald.	William Pagan, Esq.

GENERAL COMMITTEE FOR PRIZES.

Professional.	*Amateur.*
Mr Thomas Shade.	Dr Home.
Mr James Stewart.	Professor Dunbar.
Mr William Macnab.	Sir Geo. Mackenzie, Bart.

Superintendant of Experiments,
Mr John Fletcher.

Painter of Fruits and Flowers,
Mr Patrick Syme.

The Vice-President for the day, is *ex officio* a Member of the Committee for Prizes. The Secretaries are *ex officio* Members of all Committees.

PRIZES

PROPOSED

FOR THE YEAR 1815.

I. The production of Fruits, Culinary Vegetables, and Flowers. (Prize the SOCIETY'S SILVER MEDAL.)

To be shewn at Physicians Hall, George Street, on Tuesday 7th March.

1. The best brace of Early Cucumbers.
2. The best six heads of Late Broccoli.
3. The best six stems of Brussels Sprouts.

Second Tuesday of May, (unless otherwise intimated in the newspapers.)

1. The best Early Melon.
2. The best six seedling Polyanthuses: from seeds sown last year.
3. The best six seedling Auriculas; from seeds sown last year.
4. The best six Auriculas; stage-flowers.

Tuesday, 6th June.

1. The best Green-flesh Melon.

2. The best six forced Peaches, with names; two of each sort.

3. The best dozen Early Dutch Turnips, from seed saved by the grower.

4. The best six Polyanthus-Narcissus.

5. The greatest variety of fine Tulips, one of each sort, raised by the competitor.

6. The best twelve Ranunculuses.

7. The best twelve Anemones.

Tuesday, 8th August, (unless otherwise advertised.)

1. The best three seedling Pinks, from seeds sown Summer 1814.

2. The best parcel containing three sorts of Red, three sorts of Green and three of Yellow Gooseberries; twelve of each sort to be produced, with their names.

Tuesday, 5th September.

1. The best six Peaches, from unflued walls, in the open air, with their names.

2. The best six Peaches, from flued walls, without glass.

3. The best six Nectarines, from the open air, the kinds to be named; two of each kind.

4. The best six Moorpark Apricots.

5. The best three kinds of Plums, (Green-gages excluded,) six of each kind, with names.

6. The best three kinds of Summer Pears, six of each kind.

7. The best three kinds of Summer Apples; six of each kind.

8. The largest Pine Apple.

9. The largest and best swelled cluster of any variety of Frontignac Grape.

10. The highest flavoured Grape, of any other kind.

11. The best three seedling Carnations, seeds sown 1814.

12. The best six Carnations; stage-flowers.

13. Apples of the former year in the best state of preservation; three kinds to be produced, and at least two of each kind.

14. The best Home-made Wine, without the use of any imported material, excepting sugar; two bottles to be produced, together with an account of the method of preparing it.

A Medal for White Currant wine.
Red Currant ditto.
Black Currant Ditto.
Gooseberry Champaigne.
The best from any other material, or from a mixture.

N. B.—As it has been found, that the best wines are generally those to which no addition of spirits has been made, and as spirits are necessary only when the fermentation has been ill managed, those wines which shall be certified to have been made without spirits will be preferred.

For the best six Standard Pears, with names; two of each sort to be shewn at the Physicians' Hall, on Tuesday 31st October.

Tuesday, 5th December.

1. The best three sorts of Apples, lately introduced or not generally known in Scotland, and which have been found to *ripen well;* six of each sort.

2. The best three Colmar Pears.

3. The best three Crasanne Pears.

4. The best three kinds of Pears, three of each sort, also with names, &c.

5. The best six heads Endive.

6. The best twelve heads Celery.

7. The best twenty-five orange Carrots, (not field carrots.)

It is to be understood, that the above articles must be the produce of Scotland, and that those who gained the First Prizes for any of them in 1814, *cannot compete for the same till after an interval of one year.*

II. The production of *new* or *improved* varieties of Fruits, Culinary Vegetables, or Flowers.

Production of New Fruits.

1. APPLES.

In consequence of the Society's advertisements, several new seedling Apples have been sent, some of them of excellent quality. The Society have therefore resolved to alter their former offer of a premium to be awarded in 1822, and now propose, that a competition shall take place among the seedlings already produced, or which may be sent before the time appointed, on Tuesday 5th December 1815, when a Medal and Five Guineas will be awarded for the best; a Medal and Three Guineas for the second best; and a Medal and Two Guineas for the third best, provided that the Apples shall have sufficient merit in the opinion of the Committee. A similar competition shall take place every fifth year, and the Apples which gain the first premium at former competitions, shall be entitled to compete.

2. PEARS.

No new sort has yet been produced; and as there is greater difficulty in the case of Pears than of Apples, the Society have resolved to give a Gold Medal and Ten Guineas, for any new Pear which shall have been raised in Scotland from seed, and found to possess such good qualities as to render it worthy of being cultivated. As soon as a sufficient number shall have been produced, a competition will be announced, and a piece of plate, value Twenty-five Guineas, will be awarded to the best, exclusive of any former.

The Society recommend strongly the method by which Mr KNIGHT has obtained so many new varieties, viz. by impregnating the blossoms of one variety with another, and sowing the seeds. For instance, the Scotch Achan blossom by being impregnated with the pollen of the Cressane, Bergamot, &c. may yield seeds, from which valuable varieties may be obtained.

3. For the best new Plum raised from seed. October 1824. Gold Medal.

4. For the best new Peach raised from seed. October 1824. Gold Medal.

5. For the best new Nectarine raised from seed. October 1824. Gold Medal.

6. For an improved variety of the Dutch White Currant, raised from seed. September 1817. Gold Medal.

7. For the best new Raspberry, raised from seed. September 1818. Gold Medal.

8. For the best new Gooseberry, raised from seed. September 1818. Gold Medal.

9. For the best new Strawberry, raised from seed. July 1816. Gold Medal.

10. For the best new table Vegetable produced to the Society in the course of 1815.—*There are several Cape of Good Hope vegetables which appear worthy of trial, and the premium will be repeated.*

11. To the person who shall bring the greatest number of tender Flowers and Shrubs to a state of

hardiness, such as to enable them to endure the climate of Scotland. Gold Medal and Twenty Guineas, or a piece of Plate.

As this is a subject of great importance, the Society wishes it to be understood, that Medals will be from time to time awarded; and the above premium to the person who shall appear to have paid the greatest attention to the subject, during ten or twelve years.

12. To the market gardener who shall carry to the Edinburgh market the largest quantity of Sea-Cale, in the year 1815.

13. For the best new Rose raised from seed in Scotland.

III. Communications, &c. (The Gold or the Silver Medal to be awarded according to circumstances.)

[It is expected, that all communications will be founded on actual experiments, which must be detailed.]

1. An account of successful experiments, by which the sorts of Broccoli already cultivated, have been improved, and their Seeds saved in this climate. Five Guineas.

2. For the largest quantity of the seed of the true Scotch (not Flag) Leek saved in Scotland; to be duly certified.

3. For the greatest quantity of James's, Reading, or Strasburg Onion Seed, saved in Scotland, from selected transplanted bulbs; the quantity to be duly certified.

4. The best Account of ascertained facts, concerning the Effects of Impregnation in improving and diversifying or improving the different species of Fruits, Vegetables, and Flowers.

5. The best Method of propagating Apple and Pear Trees, without grafting or budding, which shall answer all the purposes of Paradise and Quince Stocks.

6. The best method of preserving Cauliflower plants through the winter, without the aid of glass.

7. To the person who shall have tried on the largest scale, before the Meeting in September 1816, the effect of Frames covered with oiled paper, or any other substitute for glass, on common walls, in preserving trees from spring frosts, and in forwarding the ripening of Fruits; a piece of plate or Ten Guineas. A particular account of the substance employed,—the method of making the frames and of the expence, will be required.

8. An account of experiments instituted for ascertaining the nature of, and for preventing or curing, the Mildew upon Fruit-trees and other vegetables.

9. The best account of the progress of Gardening in Scotland, giving an account of the introduction of the best of our present varieties of Fruits.

10. The best account of the method of Dwarfing Fruit-Trees, practised abroad.

11. The best Essay, detailing the practice of the author in the raising Bulbous-rooted plants from seed, particularly the Hyacinth, Polyanthus-Narcissus, &c.

12. The best method of restoring the vigour of bulbs (Hyacinths, Polyanthus-Narcissus, Jonquils, &c.) that have flowered one or more years in this country.

13. The best account of the rotation of Crops in Gardens, and the best sorts of manures to be applied to the different Crops.

14. The best account of a series of experiments instituted for the purpose of discovering the cause of Canker in Fruit-trees; a piece of Plate or Ten Guineas; five years to be allowed from 1814.

The second best—Five Guineas—or a Medal.

15. The most satisfactory comparison by experiments, of the effect of dung, fire-heat and steam,

in raising Melons; three years to be allowed from 1814; a Medal or Five Guineas.

16. The best Essay on the keeping of Fruit of different sorts, with the management of, and plan of an improved Fruit-room.

17. The best Scots Cyder and Perry of crop 1814; two bottles, to be produced at the Quarterly Meeting in March 1815.

18. Two Medals to *amateurs*, for the best, and next best drawing of any Apple of good quality, growing in Scotland, with the flower and leaf, when they can be conveniently procured, all of the natural size; together with a short communication stating the general size of the tree, its age, the soil in which it grows, and whether kept as a standard, espalier, or wall tree. The Society recommend to amateurs the style of Hooker's Pomona Londinensis, which may be seen on applying to the Secretaries.

19. The same for Pears.

20. A Medal to the gardener who shall have remained longest in one place; certificates of the length of service to be produced to the Society, in December 1815.

21. A Medal to the gardener who shall have remained the next longest period.

Note.—As it is the wish of the Society to give every encouragement to the profession, these Medals will be occasionally repeated.

22. An Extra Medal will be awarded to the Author of the Communication or Essay, on the subject which shall be determined by the Council to be of the greatest practical utility, published by the Society, in each of the Numbers composing their second volume.

It is required, that each article brought in competition have attached to it a particular motto, and be accompanied with sealed letter referring to such motto, mentioning the competitor's address, and what is to be done with the articles sent in competition, after the Committee have awarded the premiums.

Communications, either on the above subjects, or subjects formerly proposed by the Society, or on any other topic connected with Horticulture, will be received and duly attended to. They may be addressed to Mr T. Dickson, 10. *St Andrew's Street, or to Mr P. Neill,* 12. *Old Fishmarket Close, Edinburgh, the Secretaries.*

PREMIUMS

AWARDED BY THE SOCIETY.

Continued from Vol. i. p. 28.

Silver Medal.

1812.

Mar. 10. *Brussels Sprouts.*—To Mr James Kirk, Smeaton.

Early Broccoli.—To Mr William Affleck, Hirsel.

Best Winter Lettuce.—To Mr James Stewart, Pinkie.

May 12. *Best brace of Cucumbers.*—To Mr James Macdonald, Dalkeith.

Early Grapes.—To Mr David Ford, Tyningham.

Fine Polyanthuses.—To Mr William Affleck, Hirsel.

Method of destroying Pine-bug. (Extra Medal.)—To Mr Alexander Muirhead, Invermay.

June 9. *Best Melon.*—To Mr James Stewart, Pinkie.

Best Cauliflower.—To Mr John Portcous, Drummore.

July 7. *Forced Peaches.*—To Mr Robert Ingram, Torry.

Fine Pinks.—To Mr William Henderson, Delvine.

1812.

Sept. 8. *Excellent Peaches.*—Two medals awarded.

1. To Mr Thomas Barton, Bothwell Castle.
2. To Mr Joseph Archibald, Dalhousie Castle.

Nectarines.—Two Medals awarded.

1. To Mr David Trotter, Alva.
2. To Mr Thomas Barton, Bothwell Castle.

Apricots.—Two medals awarded.

1. To Mr James Kirk, Smeaton.
2. To Mr James Macdonald, Dalkeith.

Grapes.—Two Medals awarded.

1. To Mr William Wright, Leith.
2. To Mr John Porteous, Drummore.

Green-Gage Plums.—Two Medals awarded.

1. To Mr David Ford, Tyningham.
2. To Mr William Reid, Lees.

Jargonelle Pears.—Two Medals awarded.

1. To Mr Thomas Barton, Bothwell Castle.
2. To Mr James Kirk, Smeaton.

Gooseberries.—Two Medals awarded.

1. To Mr William Affleck, Hirsel.
2. To Mr Joseph Archibald, Dalhousie.

Seedling Carnations.—Two Medals awarded.

1. To Mr William Henderson, Delvine.
2. To Mr John Mitchell, Moncrieff.

Excellent Currant Wine.—To Mrs Thomson, 10. Picardy Place.

Dec. 8. *Beautiful Drawing of Oslin Apple.*—To Miss Mary Young, Queen Street.

Ditto, of Nonsuch Apple.—To Miss Farquharson of Howden.

Pears, Best six sorts.—Two Medals awarded.

1. To Mr James Smith, Ormiston Hall.
2. To Mr Robert Ingram, Torry.

1812.

Dec. 8. *Apples*, Best twelve sorts.—Two Medals awarded.

1. To Mr James Kirk, Smeaton.
2. To Mr James Macdonald, Dalkeith.

Broccoli, Best six heads of.—To Mr James ...acdonald, Dalkeith.

Sea-Cale.—To Mr James Smith, Ormiston-Hall.

Forced Asparagus.—To Mr David Ford, Tyningham.

Fine Apples. Extra Medal.—To Mr Allan Cameron, Auchincruive.

Soporific Medicine from garden Lettuce, two Medals; one to Dr Duncan *senior*, and another to Mr Henderson, Brechin.

1813.

Mar. 9. *Spring Broccoli.*—To Mr James Smith, Ormiston-Hall.

Brussels Sprouts.—To Mr David Ford, Tyningham.

May 11. *Best brace of Cucumbers.*—To Mr James Arklie, Rockville.

Fine Grapes.—To Mr James Paterson, Moredun.

Winter Lettuce.—Mr Duncan Macgregor, Canonmills.

June 8. *Best six Cauliflowers.*—To Mr David Ford, Tyningham.

Best six Forced Peaches.—To Mr George Munro, Dunse Castle.

Best Melon.—To Mr James Arklie, Rockville.

Best six Tulips.—To Mr William Crawford, North Park, Glasgow.

1813.

June 8. *Best six Ranunculuses.*—To Mr John Fletcher, Merchiston.

Best six Anemones.—To Messrs Dicksons and Company, Edinburgh.

July 13. *Fine Pinks.*—Two Medals awarded.

1. Mr Thomas Blair, Warriston.
2. Mr Alexander Henderson, Edinburgh.

Aug. 3. *Best twelve sorts Gooseberries.*—To Mr William Crawford, North Park, Glasgow.

Sept. 14. *Best Peaches.*—To Mr David Trotter, Alva.

Nectarines.—To Mr James Arklie, Rockville.

Apricots.—To Mr William Affleck, Hirsel.

Plums.—To Mr William Reid, Lees.

Pears.—To Mr James Kirk, Smeaton.

Fine Grapes.—Two Medals awarded.

1. To Mr William Harper, Donibristle.
2. To Mr John Porteous, Drummore.

Fine Seedling Carnations.—To Mr John Mitchell, Moncreiffe.

Apples kept through the year in best preservation.—To Mr William Affleck, Hirsel.

Wines, 1813.

1. *White Currant Wine.*—To Mrs Young, Edinburgh.
2. *Red ditto.*—To Mrs Sang, Loanwells, Kirkcaldy.
3. *Black ditto.*—To Mrs Paterson, Cunoquhie.
4. *Mixed Fruits ditto.*—To the Countess of Leven.
5. *Gooseberry ditto.*—To Mr Montgomery, Edinburgh.
6. *Blaeberry ditto.*—To Miss Agnes Bramwell, Wanlockhead.

1813.

Sept. 14. 7. *Parsnip ditto.*—To Mr George Kincaid, Edinburgh.

Dec. 14. *Drawings of Apples*, 1813.

Medal offered to Artists.—To Miss Beattie, teacher of drawing, Edinburgh, (White Hawthorndean.)

Medals offered to amateurs.—1. To Miss Elizabeth Berry, (Gogar Pippin;) 2. To Miss Mary Maitland, (Nonsuch and Leadington.)

For an account of the Carse of Gowrie Orchards.—To Messrs Machray and Gorrie, each a Medal.

For preparation of Opium from the Poppy in Scotland.—To Dr Howison, Douglas.

Excellent Onion Seed saved in Scotland.—To Mr James Arklie, Rockville.

Apples.—Two Medals awarded.

1. To Mr William Affleck, Hirsel.

2. To Mr James Gourlay, Chesters.

Newton Pippins.—To Mr Joseph Smeall, Millburn Tower.

Pears.—To Mr Robert Ingram, Torry.

Early Broccoli.—To Mr James Smith, Ormiston Hall.

Forced Sea-Cale.—To Mr William Affleck, Hirsel.

Forced Asparagus.—To Mr Robert Ingram, Torry.

Fine Specimens of Pears and Apples. Extra Medal.—To Mrs Bruce of Kennet.

Good Seedling Apple. Extra Medal.—To Mr John Yool, Cartside.

1814.

Feb. 2. *Best Bunch of Grapes preserved from former year's crop.*—To Mr David Ford, Tyningham.

March 8. *Best Lettuce.*—To Mr James Macdonald, Dalkeith.

Brussels Sprouts.—To Mr John Macnaughton, Edmonstoun.

May 10. *Stage Auriculas.*—To Mr William Henderson, Delvine.

Seedling Polyanthuses.—To Mr Thomas Barton, Bothwell Castle.

Seedling Auriculas. Extra Medal.—To Mr John Kyle, Keir.

June 14. *Best Tulips.*—To Mr John Morrison, Glasgow.

Best Ranunculuses.—To Mr George Kay, Restalrig.

—— *Anemones.*—To Mr Thomas Shade, nurseryman.

—— *Melon.*—To Mr James Paterson, Moredun.

—— *Forced Peaches.*—To Mr James Paterson, Moredun.

—— *Cauliflowers.*—To Mr John Porteous, Drummore.

Seedling Tulips.—Extra Medal.—To Mr John Matthewson, Edinburgh.

Aug. 9. *Gooseberries.*—To Mr Dugald Campbell, Pollock, Glasgow.

Seedling Pinks.—To Mr Alexander Porterfield, St Bernard's.

Sept. 13. *Best Peaches.*—To Mr Alexander Dods, Clerkington.

1814.

Sept. 13. *Nectarines.*—To Mr Thos. Thomson, Wemyss Castle.

Apricots.—To Mr David Trotter, Alva.

Summer Pears.—To Mr John Mitchell, Moncrieffe.

Grapes.—Two medals awarded.

1. To Mr George Munro, Dunse Castle.
2. To Mr Alexander Dods, Clerkington.

Stage Carnations.—Two Medals.

1. To Mr John Mitchell, Moncrieffe.
2. To Mr William Henderson, Delvine.

Seedling Carnations.—To Mr William Henderson, Delvine.

Wines, 1814.

White Currant Wine.—To Mrs Wilson, 53. Queen Street.

Red Currant ditto.—To Mrs Shairp of Kirkton.

Gooseberry Champaigne.—To Mr Montgomery, Prince's Street.

Gooseberry Wine.—To Mrs Rhind, Livelands, Stirling.

English Grape, ditto.—To Dr MacCulloch, Woolwich.

Dec. 13. *For beautiful Drawing of Carlisle Codlin.*—To Miss Maitland, Rankeillor.

For ditto of Golden Rennet.—To Miss Eliza Boswell, Balmuto.

Excellent Seedling Apple. Extra Medal.—To Patrick Begbie, Esq. Castlehill, Culross.

Best Apples.—To Mr James Macdonald, Dalkeith.

1814.

Dec. 13. *American Newton Pippins.*—To Mr John Walker, Melville Castle.

Best Pears.—To Mr James Smith, Ormiston-Hall.

—— *Quinces.* —— To Mr Archibald Knox, Leuchie.

—— *Early Broccoli.*—To Mr David Ford, Tyningham.

—— *Forced Sea Cale.*—To Mr James Macdonald, Dalkeith.

—— *Forced Asparagus.*—To Mr John Macnaughton, Edmonston.

Essay on Naturalizing tender Exotics.—Gold Medal.—To Dr MacCulloch, Woolwich.

A

DISCOURSE

READ AT THE

QUARTERLY MEETING

OF THE

CALEDONIAN HORTICULTURAL SOCIETY,

IN THE HALL OF THE ROYAL COLLEGE OF PHYSICIANS
EDINBURGH,

December 13, 1814,

BY

ANDREW DUNCAN, *sen.* M. D. & P.

ONE OF THE VICE-PRESIDENTS.

A

DISCOURSE, &c.

GENTLEMEN,

AMONG other prizes proposed by the Caledonian Horticultural Society, for the year 1814, it was resolved, that a Gold Medal should be awarded to the Author of the communication or essay of greatest importance, received during the course of the season.

By direction of your Council, I am now to inform you, of their having awarded that Medal to Dr JOHN MACCULLOCH of Woolwich, for his important hints and observations on the best method of Naturalizing Tender Exotics to the climate of Great Britain. In his absence, I now deliver the Medal to his friend Mr Neill, to be transmitted to him.

Of the circumstances which led your Council to the present decision, it is unnecessary, and it would perhaps be improper, for me to enter into any detail. I shall only observe, that in British horticulture, it is an object of the first importance, not only to introduce into this island the valuable vegetable productions indigenous to other climates, but to rear them here in the same vigorous and healthful state as in their native soil.

That in this, we can never arrive at perfection is indeed true. But it is now clearly demonstrated that, in defiance of climate, much more may be done than could have been expected. It now appears, that the human species are not, as was once imagined, the only production of nature that can be naturalized to every climate. It is clearly demonstrated, that this holds with regard to some vegetables; and the probability is, that it will be found to hold with regard to many others. The naturalization, therefore, of exotics, is one of those subjects which affords to the practical gardener an inexhaustible field for future experiment.

On this subject, the hints thrown out by Dr MacCulloch, well deserve the attention of every lover of horticulture. They may be usefully applied, not only to foreign vegetables, but even to the native plants of our own hills, when we wish to introduce them into our gardens. This is illustrated in a communication from another of our correspondents, who, at present, chooses to be anonymous. The ingenious author of a Letter to our Secretary, dated from Benmore, one of the highest of our Scottish hills, who writes under the fictitious name of a well known British plant, the Rubus Chamæmorus or Cloudberry, has, in a strain of elegant irony, recommended himself and his brethren on the Caledonian mountains, to the care and attention of the Caledonian gardener. If (he argues) the vegetables of a warm climate, can, by proper management, be naturalized to a cold one, analogy would lead us to conclude, that the plants of a cold region may be made to accommodate themselves to one that is comparatively warm. I may here mention, that attempts to naturalize the alpine cloudberry to the gardens of the lowlands are making by two of our most meritorious

members; by Sir GEORGE MACKENZIE of Coul, in Ross-shire, and by Mr MACNAB, in the Botanical Garden at Edinburgh.

The writer above alluded to, has even led us to entertain hopes, that by crossing the breed with the Antwerp Strawberry, in the way practised by Mr KNIGHT with some other fruits, we may obtain an improved progeny. On this subject, the words which he puts into the mouth of the Cloudberry of Benmore are: "It may be objected, that I have only one berry on each stem. But may not art supply that deficiency? Bring my flower in contact with the flower of the Antwerp Raspberry. Sow my seeds, and ten to one, but you shall have some plants with many-flowered stems, and the fruit perhaps improved." Whether, by this vegetable marriage, we shall be able to produce an improved Cloudberry, a more delicate Raspberry, or a vegetable fruit-bearing mule hitherto unknown, remains to be determined at a future period. But I am happy to say, that this suggestion is already in a fair way of being put to the test of actual experiment. Our worthy and attentive experimenter Mr FLETCHER, who, now enjoying

the fruits of his former horticultural industry, has retired from the laborious part of his profession, and cultivates his own garden only as an amateur, is already engaged in experiments on these plants: And before many years shall elapse, the hints now communicated to the public, may enable us to partake of a new and more delicate variety of the Raspberry, than any we yet possess.

Butof Dr MacCulloch's paper, and of the letter from Rubus Chamæmorus, I need say nothing. Both of them are published at full length in the first volume of the Memoirs of our Society,—a work which, I trust, is already in the hands of every one of you, and which, in my opinion, must afford to every intelligent reader, both pleasure and instruction. Most of the papers, indeed, which it contains, are the productions of men who have been more accustomed to the pruning-knife than to the pen. But they have communicated to the public in plain language important facts. For, besides the papers to which I have already alluded, our first volume contains many others which are highly interesting.

The remedy for the curl in potatoes, a disease, in some situations, highly destructive to the most nutritive vegetable yet discovered; the introduction of can-flues into hot-houses, as a means both of saving fuel, and giving more equable heat; the attaching ice-houses to gardens, as the easiest mode of preserving the most useful culinary vegetables in perfection at every season of the year; and finally, the most effectual measures for destroying various insects of the caterpillar tribe, those destructive enemies to the industry of the gardener,—are incontestible proofs of the truth of what I have asserted.

But without entering into a full enumeration of important observations, I hope you will excuse me for briefly alluding to two other particulars, which are intimately connected with domestic economy. What I refer to, are the papers on the Transplanting of Onions, and on the treatment of the Currant-bush during the ripening of the fruit. Some now present have, perhaps, already had an opportunity of giving a trial to the practices recommended in these papers; and I will not venture to suppose, that these practices have succeeded on every trial. I

have even heard from some of our number, that they have employed them without any advantage. But to me, at least, the experience of another year, has afforded conviction, that the benefits resulting from the practices recommended, have been by no means over-rated in these papers.

In company with some other amateurs of horticulture, I have visited the gardens in which these experiments were first begun; and we have there seen, with admiration, crops both of onions and currants, in a state highly improved. For my own part, I am now fully persuaded, that in the environs of Edinburgh, onions may be raised not inferior in weight or in size, and much superior in flavour, to any that were ever imported from Spain. I am old enough to remember the period, when the transplanting of Leeks, a practice now almost universal about Edinburgh, was employed by a few only of our gardeners; and I do not despair of yet living to see the period, when the transplanting of onions will be as universally, and as successfully employed.

But while I would fain hope, that by the publication of our first volume, we have obtained

some credit, and may have done some good; it is with no slight degree of satisfaction, that I can congratulate our Society on the present state of the Vegetable Market at Edinburgh. Scotland, indeed, has long been celebrated for its operative gardeners. With these we have often supplied our friends in the South. Intelligent Gardeners, and skilful Medical Practitioners, have for many years been ranked among the most honourable exports from this part of Britain. Hence, it is not wonderful, that the vegetable market at Edinburgh should have been well supplied. But, although much was formerly done, yet horticulture in the vicinity of Edinburgh, has been by no means stationary. I can, with confidence, venture to say, that the exertions of our present professional gardeners, fully support the reputation which they have derived from their predecessors. I am now, Gentlemen, past the 70th year of my age, and I have been a steady admirer both of Flora and Pomona from the very earliest period of my youth. During a pretty long life, it has been my lot to have had opportunities of visiting gardens in three different quarters of the globe, in Europe, in Asia, and in Africa: And from what

I have seen, I am decidedly of opinion, that at the present day, there is not a large city in the world which enjoys a supply of vegetable food in more abundance, in greater variety, or in higher excellence, than the city of Edinburgh. From the Potato to the Pine-apple,—from the most useful to the most delicious production of the vegetable kingdom,—we are not at present outdone, as far as my observation goes, by any large city on the face of the earth.

About forty years ago, one of the most distinguished horticulturists in Britain, at that period, the late Baron STUART MONCRIEFFE, used to boast, that from his own garden, within a few miles of Edinburgh, he could, by the aid of glass, coals, and a good gardener, match any country in Europe, in Peaches, Grapes, Pines, and every other fine fruit, excepting Apples and Pears. With these, he allowed, his table could be better supplied from the north of France, or from the south of England. He considered the Pear and the Apple as fruits which would not submit to confinement; and which could only be made to yield a healthful and delicious crop, in a climate

more steady and more genial than that of Scotland.

But it now appears, that these fruits are not an exception to the excellent productions of the Scottish garden. For it is clearly demonstrated, that Apples and Pears, as well as Pines and Grapes, may, in the neighbourhood of Edinburgh, produce luxuriant and rich fruit, under the protection of glass, and with the aid of artificial heat, when these are combined with proper exposure to pure air. Besides this, it also appears, that without the aid either of glass or of artificial heat, the finest Apples, by proper culture alone, may be produced not only in this part of Britain, but as far north at least as Rossshire, where, at Castle Brahan, at Redcastle, Coul, and various other places, Peaches, Nectarines, many varieties of plums, besides excellent Apples and Pears, have long been cultivated. I have often, at the tables of my friends in Edinburgh, been a partaker of Newton Pippins, which had been ripened in Long Island, and had been imported from New-York in a state of the greatest perfection: And I can now, with confidence affirm, that I have ate

Newton Pippins, which have grown in the garden at Dalkeith House, not inferior to the best that I ever saw imported from America.

It is indeed true, that those abundant crops, which, in America, are, as it were, the spontaneous gift of nature, cannot be obtained in Scotland without great skill and much attention. But such is the skill and attention of some of our professional associates, that they can almost completely overcome the vicissitudes of our climate, as far as respects gardening. By their skill and attention, I am not altogether without hopes of seeing better Apples in Scotland, than any that are yet known: For, in the Apple, as well as in the Potato, varieties almost infinite may be obtained by sowing the seeds.

To encourage gardeners to make discoveries in this way, your Council have proposed prizes for the best New Apples raised from the seed. In consequence of this proposal, several new apples raised from seed in Scotland have already been produced to the Society, and interim premiums have been bestowed for such, to Mr JOHN YOOL of Cartside, near Paisley, and to Mr PATRICK BEGBIE of Castlehill, near Culross.

Let us not, however, imagine, Gentlemen, that the skill to which our gardeners have already attained, is the summit of excellence. An extended and inexhaustible field for farther improvement still lies before us. And among the great objects aimed at by this Society, it is not merely our wish to communicate to the public at large, the discoveries which our professional members have already made, but to instigate them to make farther discoveries; to make discoveries on the only solid and rational foundation, careful and judicious experiment.

With these views, from the very beginning of this Society, it seemed to the founders of the institution, to be an object of the greatest importance, to obtain a Garden in which they could themselves be able to determine by experiment, the real value of the alleged discoveries and improvements communicated to them. In this particular, your Council have not been inactive. The industrious and intelligent Experimenter whom you appointed two years ago, has, at present, in progress different interesting experiments, both in his own and in other gardens. From the result of these, he will, I trust, soon be able

to report to you, how far certain plausible proposals are to be considered as real improvements in horticulture.

But from the want of sufficient funds, our Society have not yet been able to obtain a Garden which may be considered as its own property, solely appropriated to the subject of experiment, and which may not only be possessed by the present members, but transmitted to succeeding generations in our Society. Till such a garden can be procured, experiments of the greatest importance to the public, must be conducted with much uncertainty, and with many disadvantages. Of many horticultural experiments, particularly those on the naturalization of the vegetable productions of foreign climates, and on the production of new or hybrid fruits, a fair and satisfactory conclusion is hardly to be expected in less than half a century. But although our experimenter is still deprived of many advantages which may be wished for, yet your Council are not without hopes, that some impediments to his useful exertions may soon be removed. They even flatter themselves with the expecta-

tion that your efforts to promote the public good, may be supported, not only by the patriotism of the country, but by the liberality of a wise Government and an enlightened Sovereign. By the combined influence of these different causes, operating for the real benefit of the nation, the Caledonian Horticultural Society may soon be provided with a permanent Garden, in which experiments for the improvement of the vegetable productions of the British Empire, may be conducted with every possible advantage.

MEMOIRS, &c.

I.

Description of an Economical Hot-house.

By Sir George Steuart Mackenzie, Bart. Vice-President.

In a Letter to the Secretary.

(Read 13th December 1814.)

Before requesting that you would submit to the Society a short description of a hot-house on a construction intended to be economical, I felt it incumbent on me to wait patiently for the result of experiment, and not rashly to bring forward a plausible speculation, such as has frequently led to much expenditure, afterwards regretted.

Having been often surprised at the cost of hot-houses, the most moderate of which appeared to put the innocent luxuries afforded by them, out

of the reach of moderate fortunes; I resolved to attempt erecting one which should combine the least possible expence, with means of raising more fruit in a given space, than was done by any of the plans in common use. This you may think a bold attempt, when you consider the great variety of plans which have been submitted to the public; and probably, you may suppose it impracticable. Nevertheless, it has been accomplished, and attended by such success, that I am inclined to flatter myself it will be the means of enabling many persons to enjoy the productions of a hot-house, who never expected to possess them, and of adding so much to the produce of market gardens, as to increase the quantity of the richer fruits brought to towns, and consequently to lower their price, as my plan of training may be applied to houses already built.

The first thing that occurred to me as an object in which economy might be exercised, was the ends of hot-houses being made of glass. I could see no necessity for this; and it appeared plain, that a solid end of masonry, with a porch and double door, would be more effectual in preventing the escape of heated air, or the rushing in of cold, than a glass end, and a glass door.

The next object I had in view, and for which I desired a remedy, was the frequent occurrence

In this figure P is the porch, and Q the furnace; and two of the front sliding sashes are partly open. A Rain spout is carried from A to B, and the water conducted into a reservoir within.

Elevation

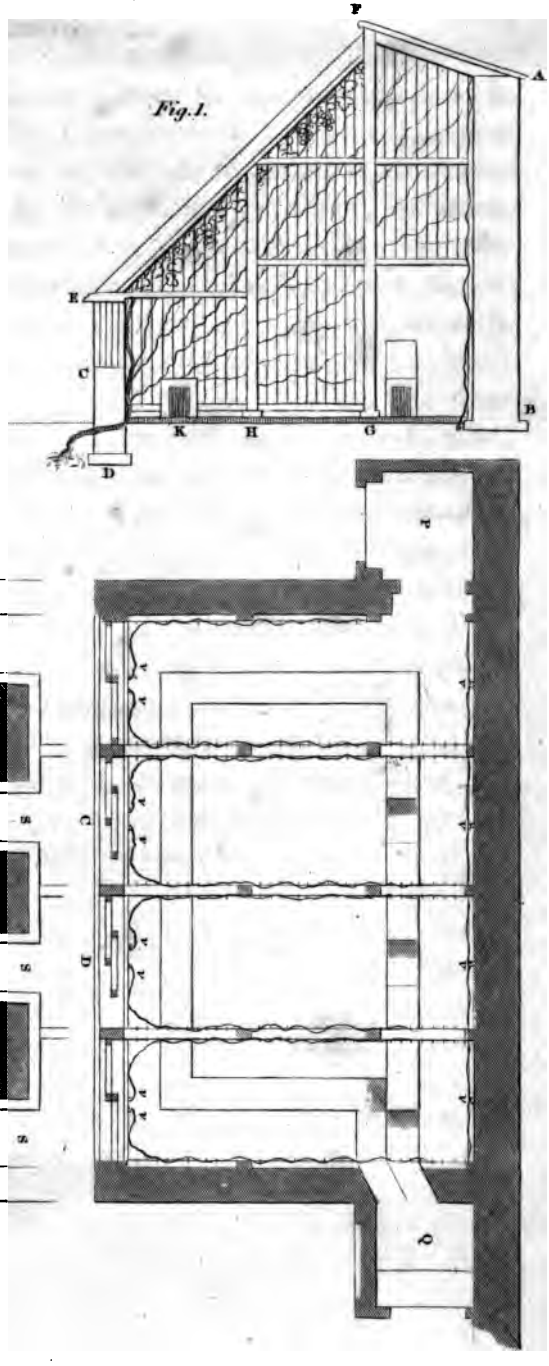


Fig. 1.
F
A
E
C
B
K
H
G
D
Fig. 2.
Fig. 3.
10 Feet
5

of breakage, during the movement of the sashes in giving air; and I conceived it to be possible to have them always fixed, and yet to have ample means of ventilating the house. I considered also, that much expensive workmanship might thus be avoided. These are matters of some importance; but the principal improvement to which I wish to call the attention of the Society, is the method of training the plants.

Fig. 1. is a section, the outline of which shows the figure of the end walls, while the whole exhibits the interior arrangement. A B is the back wall, fifteen feet high; C D the front wall, two feet high from the surface of the ground; E F A G H show the frame-work, which is set up at distances of six feet across the house; F A is a roof covered with composition, and in which there are hatches which may be opened by cords and pulleys, or by levers, and shut by their own weight. The number of these hatches may be regulated by the size of the house, and the degree of ventilation required. In the front E C there are sash-frames made to slide past each other, as seen in fig. 2. C D, so that, in each division, about eight square feet may be opened. When the front is opened, and the hatches raised, a current of air instantly passes through, and it may be regulated at pleasure, while all motion of the great front

sashes E F fig. 1. is avoided, and consequently all risk of breakage from that cause.

A trellis is formed on the cross frame-work, as seen in fig. 1. on which the vines, peaches, &c. are trained, as represented. There are two trellises on each frame, as seen on the plan, fig. 2. and the vines are planted at *v v*, two in each division, and one at every six feet on the back wall. Each vine in the divisions is trained to its respective trellis, and on half of the front sash, so that this method does not supersede, but is only an addition to, the common method of training. The house I built on this plan six years ago, is forty-two feet long inside, and part of it is separated for peaches and nectarines. The plan is twenty-four feet, which, by the ordinary mode, would give a surface for training of about 1050 square feet. The addition which I now propose, nearly doubles this, by adding about 950 square feet. It allows of a greater variety of vines being planted, so that there may be a sufficient number to choose out of when they come to bear. In large houses already built, by raising vertical trellises across them, many kinds of fruit may be forced, for which it appears at present there is no room, and many fine exotics cultivated.

The flue, in such a plan as I have drawn, may be conducted as it is represented. Fig. 3. is a longitudinal section; S S S being spaces for passing into the divisions, which, by contracting the

flue at different places, retard the heated air in the higher parts, the advantage of which is very obvious. The rest of the flue is low, as marked in fig. 1. at K. It may be managed, however, in different ways.

I can, from experience, assure the Society, that I have had as good fruit on the vertical cross trellises, as under the glass, or on the back wall; and had I not succeeded to my utmost wishes, I should never have brought the plan into notice. It is my intention, some time hence, to construct a house, with partitions of brick instead of trellises, which last, however, look best. But when use, and not appearance is studied, I should be inclined to give brick a decided preference, for many reasons; and among others, on account of the facility with which the temperature could be regulated. In fig. 2. P is a small porch, the outer door of which is always shut, before that of the house is opened, to prevent, when necessary, the rushing in of the external air. Q is the furnace.

II.

On the Cultivation of the Guernsey Lily, as practised in the Island of Guernsey.

By Dr MacCulloch, Woolwich.

(Read 14th June 1814.)

In a short notice relating to the cultivation of exotics in the Island of Guernsey, read before the Society last year, I took occasion to remark, that the *Amaryllis Sarniensis* or Guernsey Lily, might possibly be induced, under proper treatment, to flower in our own island.

It is certain that this plant is not a native of Guernsey, since it is always in danger of perishing during winters of extraordinary severity, such as was that of 1794, which destroyed nearly the whole of the roots in the island. It is known to be a native of Japan; and it is a popular tradition in Guernsey, that the roots were there introduced by the accidental wreck of a ship from

some part of the East Indies. I observed in the paper to which I now refer, that many delicate bulbous roots were, equally with this one, successfully cultivated in that island. A popular notion, the consequence of preconceived opinions and limited trials, has prevented the experiment on the *Amaryllis Sarniensis* from being pursued in Britain, on such a scale, and with such perseverance, as can alone, in cases of this kind, afford a probability of success. If we revert merely to the circumstances of climate under which these differences are experienced, it does not appear that there are any sufficiently striking to preclude it in our own; since the only remarkable distinction, and that which seems alone to affect the results, severity of frost, may, with regard to bulbous roots, be tolerably well obviated by the methods in common use with gardeners. As the mode of managing the plant in this island is perfectly simple, and may be practised any where, I shall have done all that is requisite as a preliminary to this object, if I describe it for the guidance of those who may be inclined to appropriate a few square yards of ground to this object. In the department of the flower-garden, it is assuredly worthy of attention, since the beauty of the flower itself, its durability while flowering, and the advanced season to which the blossom endures, render it peculiarly desirable, when the sweet-

ness and splendour of all the productions which this elegant branch of horticulture includes are fast expiring.

Like most other bulbous roots, this plant requires a light and rich soil. It produces offsets in abundance. Once in three or four years, and in the month of July, when (in this island) the leaves are dead, the roots are taken up, for the purpose of removing the offsets. The largest roots are then separated, and planted in beds, at a distance of nine inches from each other. These beds are reserved for flowering, while the smaller offsets are planted in separate beds, and treated in a similar manner at the end of an additional period of three or four years. They are found to flower most certainly and most successfully, when they are planted in open beds exposed to the sun. In the hands of the little farmers, almost every one of whom has a spot appropriated to this favourite object, they are both separated with less care, and treated with less attention; since they are commonly planted in the orchards, under the shade of apple-trees. Among them the produce in flowers is consequently neither so vigorous nor so abundant.

It is necessary, even in this mild climate, where the frost seldom penetrates half an inch below the surface, to protect the bulbs from its action. This is in general easily effected, by a covering of sand

of the depth of an inch or less. It is evident, that a greater degree of protection against this enemy to tender exotics, would be required in our own more severe climate; but as the means of giving this protection are simple and practicable, there is no difficulty in effecting it. In the milder climates of the western side of our island, it might probably be effected by means as simple as those used in Guernsey.

These are the only practices by which the cultivation of this root is distinguished. But I must again repeat, that its tendency to flower is not great; in technical language it is shy of flowering, even in Guernsey,—a circumstance which appears to be common to it, with many other plants well known to gardeners, and which I need not enumerate, plants, whose delicacy of sensation appears to suffer from irregularities of temperature so minute, that we are unable to appretiate them by any other test. Scarcely five flowers are produced annually from a hundred healthy roots. It is for those horticulturists to whom the beauty of the flower-garden is an object of attention, to calculate the relative value of the toil and reward. Let them at any rate be assured, that he who sows not, shall not reap.

III.

On Wire-Grates, as a means of preventing Wasps from entering hot-houses.

By Mr JOHN MACHRAY, Errol.

(*Read 13th December* 1814.)

THERE are few avocations in life which require more attention to a diversity of objects than that of a gardener.

After having, with the greatest care and attention, brought his trees to a bearing-state, he is obliged to maintain a perpetual contest with ignoble enemies: the feeble efforts of puny insects are often to him the source of many painful sensations. Taken singly, they may appear contemptible; but numbers render them formidable. Even the elements sometimes conspire to blast his expectations. On the one hand, he sees aphides in numberless myriads roll up the tender foliage of the peach; the coccus preys upon the bark;

and not unfrequently, the mildew is to be found combined, to deprive the tender shoots of the same tree of vegetable life.

To enumerate all the enemies from which the gardener has to defend his charge, would be to give a list of all the quadrupeds, birds, insects and reptiles, that subsist on the root, the bark, the foliage, or the fruit of plants.

The summer of this year (1814,) will be long remembered by the gardener and the bee-master, for the immense swarms of wasps, which so long a tract of dry weather tended to produce. After much labour and expence bestowed on dressing cherry-trees, it was painful to the gardener to see the fruit of his labour destroyed, almost instantly, by numbers of voracious wasps. In common with others, I felt the evil severely. No sooner were the cherries devoured, than the strawberries, raspberries, gooseberries and plums became, each in their turn, the object of their attacks. Even the industrious bees felt the severe effect of their uncommon numbers; so much so, that one of the hives in the garden here was completely subdued. For this last evil I hit on a remedy. I contracted the entry of the remaining hives, and lengthened the passage by a piece of clay, in the form of an arched way; so that the bees met their enemies in a narrow pass, and

were thus better able to defend themselves, and their treasure.

I had long ago concerted a plan for preventing wasps from entering grape-houses, and I now found it absolutely necessary to put something of the kind in practice.

I had observed an excellent paper on that subject, written by my friend Mr Dick, which appeared in the 4th Number of the Society's Memoirs *; but not having proper cloth by me, I did not choose to put Mr Allan to so much expence as that article would have required. The glass in the vinery being cross puttied; I had frames made three feet square for the top and bottom of every third sash; the sashes being all moveable: these frames were made exactly to fit between the rafters, and were placed, so as the sash could move up and down over them; and that there might not be so much vacuity between the frame and the sash as admit a wasp, a groove was cut on the under side of the upper bar of the sash, to admit the rope by which the sash is hung. When it comes in contact with the under part of the wire-frame next to the wall-plate, there is an aperture to admit the pully; this end inclines downward from the run of the sash, to give room for the rope and pully to work with freedom in opening or shutting.

* Vol. i. p. 356.

The frame is made of fir-wood, well seasoned, to prevent its warping, and is inch and quarter thick; the sides and lower end are two inches, and the upper end, where the pully is inserted, is six inches in breadth. The open space is covered with wire of No. 17. worked about one-eighth of an inch asunder, and inserted into the wood at both ends. There are cross wires of No. 5., placed at six inches distance from each other, to which the longitudinal wires are warped, to keep them firm. In each of the frames I have made holes with small wire turned down, similar to the entrance into a wire mouse-trap. At those, I place large phials half filled with sour beer. The wasps are eager to get into the grapes by every possible means of entry, and are next enticed by the beer to enter the phial, where they perish in great numbers.

All fruits raised within the limits of a hot-house, require a large portion of air to render them sweet and high flavoured, particularly at the time of ripening: This will appear obvious, if we compare peaches raised in a hot-house, with peaches ripened on an open wall. I shall leave it to chemists to determine, by what means the air is rendered less salubrious within than without a hot-house; and shall only mention, that as I judged a free course of air necessary for improving the flavour of the grapes at the time of ripening, I constructed the frames as above described, to ad-

mit a sufficient proportion of that essential element.

The frames may be made at a very trifling expence; and as they are in use only about two months in a season, the expence of making new ones will not frequently recur.

I may also mention, that I divested the beehive which the wasps had overcome, of the remaining wax and honey, and placed in them three mugs, half full of sour beer, leaving them in the same place where they were before. By this stratagem, I killed about three choppins of wasps daily; so that, with what was destroyed by the phials in the wire-frames, I soon succeeded in clearing the ground of them; and preserved the bees from their lawless enemies, and the late wall-fruit from threatened destruction.

IV.

On the Cultivation of Figs in Scotland.

By Mr James Smith, Gardener, Ormiston-Hall.

(Read 14th June 1814.)

Ficus, the Fig-Tree, was at first arranged by Linnæus in the Class *Cryptogamia*, but afterwards transferred to the twenty-third Class and third Order, *Polygamia Triœcia*. It produces fruit of a very peculiar nature, proceeding immediately from the shoots, without any visible flower, forming a singular contrast with most of the other cultivated fruits, which are generally pericarpiums, enclosing the seeds of the plants, the rudiments of which, accompany and form part of the flower; whereas the fruit of the fig is a common receptacle, enclosing and concealing all the other parts of fructification.

Although the fig-tree is a native of the south of Europe, and other warm latitudes, yet, by care and attention, the fruit may be brought to con-

siderable perfection even in this northern climate, and instances are not wanting in this country, where the trees attain a considerable magnitude, and produce fruit in abundance.

Various and contradictory are the methods which have been pointed out for the management of fig-trees, some of which are more apt to mislead than instruct those unacquainted with their cultivation. Ever since the writer became acquainted with the cultivation of fruit, the fig-tree has been an object of his particular attention. After various methods and trials, he has followed a plan for some years past, which has answered his most sanguine expectations, and produced fruit on the walls in the greatest perfection. He, therefore, has no hesitation in communicating the result of his practice to the Society.

The sorts of figs best adapted to the climate of Scotland, are those which ripen early, such as the Brown or Chesnut Ischia, the Black Ischia, the Black Genoa, and the Small Early White. The figs cultivated at Ormiston-Hall, are the Brown and Black Ischia, with some raised from seed, which are not yet come to a state of bearing.

Fig-trees may be raised by suckers, layers, cuttings, and from seed. Layers are certainly preferable to cuttings; as in one season, the plants

may be fully rooted, and attain a considerable size. The objections to suckers, are, that plants raised in this manner, are more liable to produce large quantities of suckers than those raised from layers or cuttings.

To those who are curious in the cultivation of figs, the following account of raising the plants from seed, may not be unacceptable. Four years ago, two or three of the preserved imported figs, were broken open, put into the flat of a flower-pot amongst water, and then placed in a hot-bed: After standing twenty-four hours, the seeds were considerably separated from the pulps; they were then sown in a middle-sized flower-pot, and plunged in a melon hot-bed. In a short time, a large quantity of young plants appeared. After standing some time, they were planted singly in pots, and for the two succeeding winters, placed under glass; after which they were planted against walls. Although the young plants have made but little progress, yet they appear healthy, and there is every probability of their growing to considerable trees.

It is presumed, that the cultivation of figs will not be undertaken in this country with any prospect of success, without the aid of a wall. The best aspects are south, south-west, south-east, or any intermediate one. Fig-trees have been tried on various soils at Ormiston-Hall; some have

been planted on light gravelly soil, others introduced on the top of a rock, three feet above the level of the ground, and trained to a wall built on the top of the rock. The plants take root amongst lime-rubbish, betwixt the rock and wall, and are nourished by soil on the back, which rises to within two feet of the top of the wall; in neither of these situations, have the trees thriven, or carried much fruit, of late years. But the soil in which the fig-trees have thriven best, is a friable loam, pretty rich, and of considerable depth: in this situation, the trees have extended to a large size, and produced excellent fruit.

Thus it appears, that fig-trees arrive at the greatest maturity in a rich friable loam. Any latent water in the borders, should be particularly guarded against, as its effects are very pernicious to the trees. Having provided good young trees, the most proper time to plant them, is towards the end of April, when there is the least danger of spring frost.

In pruning young fig-trees, the shoots may be shortened for a supply of vigorous wood; but after the trees advance in growth, the pruning-knife should be used as sparingly as possible, and none of the young shoots shortened, except for a supply of wood to fill up any vacancy; as by shortening the shoots, an unnecessary quantity of young wood is produced, and is the means of

lessening the quantity of fruit. A principal object in training the trees, is to have a regular supply of young wood over their whole extent, as it is from the young shoots that the foliage and fruit are produced. The old wood should therefore be regularly thinned out as the young shoots advance, that no part of the trees may appear naked or unsightly. The most proper method of training, is certainly the fan form; but the lower branches should be laid as much horizontal as possible, and the trees encouraged to extend on the lower part of the wall, to prevent the branches from being too much crowded in an upright manner in the centre of the trees. The young branches should be from ten to fourteen inches distant, according to the size of the foliage of the different sorts.

As to the most proper time for pruning and nailing fig-trees, after several trials, the early part of autumn has been found most beneficial to the trees, and, of course, to the fruit next season. As soon as the leaves begin to drop, they may be assisted by a broom, which should be used gently; but the leaves should by no means be forced off in a violent manner, otherwise the trees will be apt to bleed at the place where the foot-stalks of the leaves were joined to the shoots. As the foliage of the fig-trees is easily affected by early autumn frosts, the operation of pruning and nailing may be got

over in the end of October, or the beginning of November. At this time, the young shoots should be cleared of all untimely half-ripened fruit, and laid as close to the wall as possible; but all young fruit of the size of small beans or pease, must not be touched, for if they survive the severity of winter, they will be the first ripened fruit next season. As the weather is frequently mild after the above mentioned period, the young shoots ripen considerably after they are nailed close to the wall, and are better enabled to stand the inclemency of the winter.

Having thus pruned and trained the trees, the next object of attention, is to cover and preserve them through the winter; but no covering should be applied as long as the weather remains open. On the first appearance of severe frost, a quantity of spruce-fir branches should be procured, preferring those that are from three to six feet long, and the trees covered all over with them. They should be fastened to the wall by the middle rib of the branches, at two different places. To prevent any friction by the wind, the branches should be made to fit each other, that the covering may be of a regular thickness, over every part of the trees.

The superiority of spruce-fir branches, to every other species of covering, will soon appear obvious to those who will make a trial of it. As the covering is generally put on the trees in the month of

December, the branches remain green all the winter; and in the month of March, when the days get long, the leaves begin to drop from the branches, and continue falling through April; and by the beginning of May, when the covering is entirely removed, only the ribs of the branchas are found remaining. Thus, the progress of the season reduces the covering in a gradual manner, so as not to expose the trees to any sudden check, which might otherwise be the case, if they were all at once laid open to the weather.

In the course of the summer, the trees should be examined from time to time, displacing any irregular or unnecessary shoots, and training those that remain to the wall as they advance in growth. When the fruit begins to ripen, which is generally in September, they should be as much as possible exposed to the sun. For this end, the leaves that cover the fruit should be braced to the wall by their foot-stalks, with very small rods of any kind,—a practice well known to every professional gardener.

The fig-trees at this place, have been treated after the above method for several years past, and have produced good crops of large sized fruit of excellent quality. The figs have been considerably forwarded in their ripening, by the protection afforded them in the spring, and, every circumstance considered, their culture has been attended with success far beyond expectation.

Although this place is elevated very considerably above the level of the sea, the climate may be said to be moderately good, though certainly none of the earliest. Yet, as the figs ripen properly, there is little doubt, but that their cultivation might be carried to a considerable extent in Scotland, if they were treated in the manner here recommended.

ORMISTON-HALL,
4th March 1814.

V.

On the cause of Blotches on the Shoots of the Peach-Tree.

By Mr JOHN KINMENT, Gardener at Murie.

In a Letter to Mr NEILL, Secretary.

(Read 14th June 1814.)

SIR

I TAKE the liberty to send you a few hints respecting blotches on the shoots of peach-trees, and on the proper soil for those trees.

To protect this exotic from the severe storms to which we are in this northern climate so often subjected; to preserve it against the various attacks of insects, mildews and blights, have often employed the most skilful horticulturists. There is, however, a malady, to which these tender trees are very subject; concerning which nothing within the reach of my information has been written: I mean certain black lifeless spots,

which are very apt to appear on the young shoots during the summer months. I have often been sorry to see the shoots, not only of old trees, which we might suppose worn out, but also of young trees, whose shoots at first sight would be thought fair and luxuriant, with their young bark infected with that malady. It often gains ground, and proves fatal to the tree: at any rate, it produces a very disagreeable appearance.

I have heard various reasons assigned as the cause of this disease, such as damp bottoms, and exhausted soils. If this malady only appeared on old trees, or on young trees planted on old borders, these conjectures might be adopted; but it is no uncommon thing to see these black spots appear on trees in new gardens, the first, second, or third year, after planting And from what I have experienced in the course of the last two years, I think I may venture to suggest, that it proceeds chiefly from over dunging, or making the border too rich.

In support of this doctrine, I shall briefly state to you what I have experienced on this subject at Murie.

In the cold wet season of 1811, the peach-trees, which had formerly looked well, and borne very profuse crops, gave evident signs of approaching decay; and I found it necessary, in

the spring following, to supply their places with young trees. The border being very damp at bottom, I had it properly trenched and drained. I then dug pits for the young trees, about six feet diameter,—wheeled away all the old mould, and, at the time of planting, filled up the pits with new mould. As it had occurred to me, that it might be the richness of the soil that produced the black spots, I was then determined to satisfy myself on that particular, by experiment.

Some time in the beginning of winter 1811, I collected together a rich compost heap, (No. 1.), consisting of one-third light loam; one-sixth strong clay; one-twelfth lime; one-sixth hot-bed dung; one-sixth vegetable mould, and one twelfth pigeon-dung: At the same time, I collected another heap, (No. 2.), much less rich, consisting of one-half light loam; one-fourth strong clay; one-eight earth from scourings of ditches; one-sixteenth lime, and one sixteenth hot-bed dung. These heaps I turned over occasionally, in order that they might be well meliorated by the frosts. About the middle of March 1812, I planted the trees, and applied to the roots of a few of them the rich compost of No. 1.; but the greatest number of them was planted with the compost No. 2. About the latter end of June, I examined the young trees all over: The shoots they had made were nearly all of the same size; but I was no way disappoint-

ed, when I found those I had planted with the rich mould, sadly infested with black spots; while those planted with No. 2. remained whole and sound. There being only the few which were planted with No. 1. infested with the black spots; with my knife I cut the blemishes entirely out; and about the latter end of September, I found the wounds completely whole. Early in the spring 1813, I cleared off the rich mould entirely from their roots, and suplied the vacancy with No. 2: and at the end of last season, I had the happiness to see them succeed to the utmost of my wishes, free of black spots.

If you think that these simple facts merit the attention of the Caledonian Horticultural Society, your communicating them will oblige, &c.

MURIE,
2d March 1814.

VI.

Account of the Orchards in the Neighbourhood of Newburgh.

By Mr DAVID BOOTH, Newburgh.

(Read 13th September 1814.*)*

NEWBURGH and its surrounding gardens are situated at the north bottom of a hill, and have a pretty steep acclivity. They occupy a plot of ground nearly rectangular, of about twenty-five acres. The town is a single street, cutting this area in two nearly equal parts lengthwise. This street lies in the direction of the river, which runs about a gunshot below the town, from west to east; and hence the gardens, of which each house has one, lie to the north and the south of the street, and may collectively measure from ten to eleven acres on each side. Those on the north are almost wholly covered with fruit-trees. The soil is a deep black mould, with a substratum in the higher ground of red, and in the lower of blue, clay. The latter subsoil is obviously more

more favourable to apple and pear trees; and wherever it is found here, the land is apparently *alluvial.*

The gardens to the south have only about a third of their extent planted with fruit-trees, and these are much less productive than those in the north gardens. As we ascend the hill, though the soil is good, and generally two to three feet deep of black mould, yet there is under it a stratum of *red till clay*, which is destructive to the trees, as soon as they have acquired size sufficient to shoot their roots so far downward; for they then become stunted and barren. This is the general opinion here, but I suspect that there is another cause which at least co-operates:— The gardens have a considerable declivity, and the ground above them is steep, with a light soil, and rocky bottom. Hence the rains and undrained springs of winter filter through the gardens, and spread along the surface of the *till clay*, where they meet with the extreme fibres of the roots (that can pierce no lower), and immerse them, during six months of the year, in a fluid unfavourable to their nature. The pear-trees require a depth of soil which these south gardens may not possess; but I cannot otherwise account for the failure of the apple-trees, which I have seen very fruitful in a much thinner soil. The street which crosses the whole, cuts off the

north gardens from this subterraneous inundation.

Newburgh owes its origin, as well as its gardens, to the Abbey of Lindores. The ruins of this abbey are about a quarter of a mile from the town; and there are still decided remains both of apple and of pear trees planted by the Monks. Indeed, there is a pretty thickly planted orchard, covering seven or eight acres, which has existed unaltered since before the Reformation.

The fruits of the old pear-trees at the abbey, are in general of the worst possible quality; or perhaps they have greatly degenerated. The few that are tolerable are *Drummonds*, *Swantons*, and the *Green Pear of Hill*. There were formerly *Crawfords*, *Lodge Pears*, and *Scotch Bergamots*; these all died several years ago. The original names of the other Abbey pears are unknown; but the people here, have, from time immemorial, given them names corresponding with their nature: such as *Choak Pear*, *Pear Soot*, *Pear Wash*, *Pear Deil*, and other appellations still more expressive of disgust!

There is one pear-tree of extraordinary size, though a part (perhaps a fourth) appears to have been cut off at some distant period. The fruit is small, round and grey, resembling what we here call *Gold-knaps*, but very inferior in flavour. Fruit at Newburgh is sold by the *heaped*

barley firlot, and twenty-four such firlots have been taken from this tree in one season, in different years. Indeed, it seldom fails of a heavy crop.

The culture of the pear-tree must have been very defective when the Abbey orchard was planted. It is probable that the Monks would have selected the best kinds then known, and of this, the apple-trees are a proof: for they are famous throughout the country for the fineness of their flavour. The greater part are *French Rennets*, and *Black* or *Grey Courpendues*. The *Newton Pippin* is a large green apple, with red streaks and protuberances. These apples were formerly called *Macleans*, and are nowhere else in the neighbourhood; they have an excellent flavour. Another large apple of a coarser quality, is called the *Tower of Glammis*. There are several *Wine apples;* but they do not appear to be so old as the others. Some years ago there were a number of very fine trees of the *Early Honey Plum*. There are still some of these at Newburgh, but they are in the last stage of decay.

The gardens of Newburgh are famous for pears. Some of the trees seem to be very old; but less so than those of the Abbey. The general kinds are:

Crawfords.
Black Achans.
Boncretiens.
Drummonds.
Longuevilles.
Benvies.
Christies.
Pandies.
Jargonelles.
Gold-knaps.
Swantons, and
Lodge Pears.

The four last are many of them very old; and the *Lodge Pears* particularly, cannot have lived less than three centuries. They are the most productive trees in Newburgh, and by far the largest. But, notwithstanding of their size, they are obviously the children of a more ancient race, for they have been engrafted on an older kind. The stock below has an additional thickness; and when sprouts are allowed to grow below the graft, the fruit on such branches is the same as on some of the worst trees of the Abbey. This shows that the gardens of Newburgh had improved their kinds, while the Abbey continued in its original state. The practice of changing the qualities when found bad is very general here. A tree, perhaps 100 years old, is cut down. It sets out shoots on which another kind is engrafted: and

the pears of which we here speak, appear to have been engrafted on very old trees.

The theory that grafts have a tendency to decay with the parent stock, has many supporters here. They notice particularly the *Dutch Bergamots*. As the old trees are fast decaying, every attempt has been made to rear new ones, but without success. Whether engrafted here from the old trees, or procured from nurseries, they invariably fail. The same has been observed of the *Newton Pippin*, and *Black Courpendues* of the Abbey. No graft from these can be made to prosper. The *Lodge Pear*, too, cankers and decays, though it is commonly sold in the neighbouring nurseries. It is farther remarked here, that a second graft, that is, a graft upon a graft, though of the same kind, considerably improves the flavour of the fruit, and also materially alters its appearance.

For the last four years, the fruit at Newburgh has been almost totally destroyed by a species of the *phalæna*, which attacks the tree, in a manner similar to what is described in the Society's Memoirs, by Mr Sang of Kirkcaldy. A number of people who have little else than their small orchards to live by, have felt the depredation very severely; and almost all despair of ever getting rid of these destructive insects.

The following is an account of the produce of the largest orchard in the place for thirteen years past. It contains about two acres, and will serve

as a specimen of the loss occasioned by these vermin; to which the deficiency is solely to be attributed.

	Apples.	Pears.	L.	s.	d.
1801.	9s. to 10s.	14s. to 15s. *per* Firlot,	71	15	3
1802.	12s.—14s.	17s. - -	34	2	6
1803.	7s.—8s.	9s.—10s. - -	56	15	8
1804.	10s.	16s. - -	22	18	8
1805.	10s.	12s. - -	26	5	0
1806.	9s.—10s.	12s. - -	52	8	9
1807.	13s.	13s. - -	21	19	0
1808.	10s.	13s. - -	26	0	0
1809.	10s.	15s. - -	23	1	9
1810.	15s.	18s. - -	6	17	0

1811, 1812 and 1813, have not yielded 5 firlots *per annum*, and this may be reckoned a fair average of Newburgh.

It is very remarkable, that the Abbey Orchard, though within a gunshot of these gardens, has hitherto escaped the depredation. It does not, however, appear, that the age of the tree is any security against the attack. The only general observation is, that the worms are good judges, and invariably prefer the tree whose fruit is of superior flavour. The old people remark, that where the elder berry grows, there are few or no worms. This shrub is plentiful at the Abbey.

Newburgh,
22d Nov. 1813.

VII.

On destroying Insects on Peach, Nectarine, and Cherry Trees; and on the Treatment of Gooseberry Bushes.

By Mr John Naismith, Gardener, Culloden-House.

In a Letter to Mr Neill, Secretary.

(Read 13th September 1814.)

Sir,

Permit me to give you an account of my mode of treatment of peach and nectarine trees, that were once almost destroyed by insects; and though it does not exhibit any thing new, or of experimental value, yet it may possibly encourage others to try it, as it is attended with little or no expence.

For several years prior to 1803, my peach and nectarine trees on the open walls, were every year more or less destroyed by the *aphides*, even in spite of tobacco fumigations, and frequent waterings with the engine.

In the latter end of May 1803, (owing to a severe family distress,) they were quite neglected for the space of three weeks, and were so completely cut up by these insects, that it was conjectured they would never recover, and must be turned out. Willing, however, to give them another trial, in the month of March 1804 I had them all unnailed from the walls; then I cleaned the bricks, by rubbing the wall strongly with a hard brush, such as is used for scouring rooms; and I next white-washed it with new slaked lime and water.

The trees being carefully pruned, I had them as carefully cleaned, by rubbing them all over with a small dry brush, such as is used for cleaning plate; taking particular care that none, even of the smallest shoots, should be neglected; and by introducing the brush into every hole, joint, and angle, where any eggs or filth could possibly lodge, I collected the old shreds and burned them, to prevent any of them being used. I then nailed the trees to the wall again.

The whole of this operation I have repeated annually on the peach and nectarine trees since the above period, except the white washing which I did not find necessary; as I have not been distressed, to any degree, with either the green-fly or the wood-louse since I began to follow this plan; and our trees are still in a healthy state, though most

part of them are thirty years of age, being planted in 1783 and 1784.

Our cherry trees, both in the open air, and on the natural walls, particularly the tops of the young shoots, are much attacked with a small black insect, provincially called the *Black Beetle*. The remedy I have found most effectual for their destruction, is a mixture of pitch, with one sixteenth part of powdered orpiment, one sixteenth part of sulphur, dissolved over a slow fire in an earthen pipkin, until they be well incorporated: when cold, divide it into small pieces, about the size of a hen's egg, and burn it under the trees with damp straw, directing the smoke as much as possible where the insects are most numerous. In an hour afterwards, (if the state of the fruit will admit,) give the trees a good washing with the garden engine, which generally clears off the half-dead beetles, and prevents the spreading of the red-spider.

Treatment of Gooseberry Bushes.

As soon as the leaves are all fallen, I begin pruning, and dunging, if need require. I then dig the ground between the bushes, leaving the ground as rough as possible; and as the diggers are proceeding, that is, as soon as they are clear of

the first plant in the row, I give the bush, from the rose of a watering-pot, at least an English gallon of the following mixture, of equal parts, viz. lime-water, chamber-ley, and soap-suds, in which I introduce as much soot as to give the composition the colour and consistence of rich dunghil drainings; proceeding over the whole in this manner, without treading or poaching the ground: in which state they remain until the winter frosts are fairly past, when I level and dress up the ground between with the rake.

This practice I have invariably performed, and have always had healthy fruitful bushes, and never in the least annoyed with any insects on the bushes so dressed.

CULLODEN-HOUSE,
10th February 1814.

VIII.

On the use of Straw Ropes in protecting Fruit-tree Blossom, &c. from late Frosts.

By Mr James Laird, Gardener at Portmore.

In a Letter to the Secretaries.

(Read 8th March 1815.)

Gentlemen,

Having observed that the Caledonian Horticultural Society are desirous of being informed of the best mode of protecting the blossom of fruit trees on walls, I have taken the liberty of submitting the following method for your consideration, which I have practised with much success for a number of years; and if you think it of sufficient importance, I request you will be so good as lay it before the Society.

As soon as the buds of the trees become turgid, I place poles against the wall, in front of the trees,

at from four to six feet asunder; thrusting their lower ends into the earth, about a foot from the wall, and fastening them at the top with a strong nail, either to the wall or coping. I then procure a quantity of straw or hay ropes, and begin at the top of one of the outer poles, making fast the end, and pass the rope from pole to pole, taking a round turn upon each, until I reach the end; when, after securing the end well, I begin about eighteen inches below, and return in the same manner to the other end, and so on, till I have reached to within eighteen inches or two feet of the ground.

The above method is both cheap, and, so far as I have experienced, very efficacious; and as it does not much interrupt the rays of the sun, it may be applied early, and allowed to remain till the middle or end of May, according to the state of the weather.

The first season I tried the above method was in 1802. I had covered a peach tree, on a wall where were many others. On the 5th of May there was a heavy fall of snow, and on the morning of the 6th the thermometer stood at two degrees and a half below the freezing point. The consequence was the loss of the whole crop, except a few that were protected by the foliage. But the tree that was covered and protected, produced a fine crop.

I have also found straw-ropes to be very useful in protecting other early crops from the effects of

frost, as peas, potatoes, or kidney beans, by fixing them along the rows with pins driven into the ground.

I have also sometimes used old herring-nets, and at other times branches of evergreens, for the protecting of blossom; but I have not found any of them so efficacious as the above. Besides, straw-ropes are much cheaper, and may be obtained in every situation. I am, &c.

PORTMORE GARDEN,
8th Jan. 1813.

IX.

An account of a new Seedling Apple.

By Sir GEORGE S. MACKENZIE, Baronet.

In a Letter to the Secretary.

(Read 7th March 1815.*)*

SIR,

WHILE examining the prize fruit at the last meeting of the Society, I was particularly struck with the appearance and good qualities of an apple, marked "a Seedling," which I found had been sent by Mr Macdonald, gardener to our noble and worthy President. You may remember that I mentioned this apple to the meeting as one, in my opinion, remarkably good. I have since requested Mr Macdonald to communicate its history to me, which he has done; and he has also sent me some specimens, from which I have got drawings made by a young lady, whose pictures of fruits you have had several opportuni-

ties of admiring. After having examined this new Apple at my leisure, I have no hesitation in pronouncing it to be a *most excellent* one; and though tastes differ considerably in regard to fruit, as well as other things, I am persuaded that, when known, it will have a place among the finest apples, in every collection.

Mr Macdonald informs me, that, in 1808, he selected some blossoms of the Nonpareil, which he impregnated with the pollen of the Golden Pippin and of the Newton Pippin. When the apples were fully ripe, he selected some of the best, from which he took the seeds, and sowed them in pots, which he placed in a frame. He had eight or nine seedlings, which he transplanted into the open ground, in spring 1809. In 1811, he picked out a few of the strongest plants, and put them singly into pots. In spring 1812, he observed one of the plants showing fruit-buds. He took a few of the twigs, and grafted them on a healthy stock on a wall; and in 1813 he had a few apples. This year his seedling yielded several dozens, and also his grafts; and, he mentions, that the apples from the grafts are the largest. I am of opinion, that in giving names to seedlings raised in Scotland, the word "Scotch" should be mentioned. As this apple has more of the character of the Nonpareil than of its male parent, I propose to name it "*Macdonald's Scotch Nonpareil.*"

The seedling which Mr Begbie sent is a very pleasant apple; but Mr Macdonald's is decidedly superior in many respects, and promises to be an excellent keeping apple. At this time it is smooth, plump and firm, full of juice, and of a fine sharp and agreeable flavour. The Nonpareil seldom ripens in Scotland; and as this new apple is the nearest approach to it that has yet been made, we are much indebted to Mr Macdonald.

I take this opportunity of communicating an observation, which may, perhaps, facilitate the raising of seedlings. I have remarked, that the under side of the leaves of every edible apple is more or less downy, while crabs are smooth. Therefore, those seedlings which have downy leaves may be selected for nursing, and others thrown away; and thus ground and trouble may be saved. But, as this is true, only so far as my own observation goes, I wish gardeners to examine the leaves themselves, before they set it down as a general fact. I am, &c.

FORTH STREET,
23d December 1814.

X.

On the Management of Sea-Cale.

By Mr Thomas Barton, Gardener, Bothwell Castle

(Read 8th March 1815.)

The *Crambe maritima*, or Sea-Cale, appears now to be a vegetable in general cultivation, and brought to tolerable perfection on various soils, and by various modes of treatment; but, in general, it is found in the greatest perfection on a light sandy soil, of from eighteen to twenty inches in depth, being the nearest to that of which it is indigenous. Therefore, where such a soil is not to be met with, every means should be used to bring it as near to that quality as possible. In submitting a few practical remarks to the Caledonian Horticultural Society, respecting the cultivation and early production of this vegetable, I hope they will not altogether prove undeserving their attention, however short they may fall of indicating the most perfect mode of practice.

The soil in which I cultivate this vegetable, is a pretty strong loam, on a loose till bottom, which was previously prepared by trenching, from eighteen to twenty inches deep; at the same time mixing a good portion of vegetable mould, from decayed leaves, which had lain at least two years, to which I added a quantity of river sand. The ground is then laid out into beds, four feet wide, with two feet of an interspace, sowing two drills on each bed, about the latter end of March, or early in April; and with which may be sown any other light crop, leaving the interspaces, for carrots, cauliflower, or turnips; the ground being well prepared for such cropping, which does not in the least injure the young sea-cale plants, provided they are kept clear of weeds. In summer, the plants should be thinned, leaving them from nine inches to a foot apart in the drills. In the autumn, I cover the whole of the beds with leaves, as they are raked up from the pleasure-grounds; covering each bed in thickness according to the strength and age of the roots, giving the greatest covering to the oldest, upon an average from five inches to a foot when first laid on: over this I place a slight covering of long dung, just sufficient to keep the leaves from being blown about. The covering is suffered to remain on the beds until the whole is cut for use the following spring; after which the dung and leaves may be removed,

and the ground dug regularly over. By this treatment, the heads will be found free and well blanched, and, from the sweetness of the leaves, free from any unpleasant flavour. As the heads become ready for use, they will raise the covering, by which means they will be easily perceived, without removing any more of the covering than the part where those heads are that are intended to be cut.

Those beds which I intend for early produce, I do not cover in the autumn, as specified for the general stock; for a part will be lifted by that time, and the other before the approach of severe frost. I always leave the oldest roots for this purpose, (which are about five years standing,) keeping up a succession by sowing an equal quantity every spring. About the last week in October or first in November, I commence taking up the roots for forcing, which is done in the following manner: Open a trench at one end of the bed, and proceed in a regular manner, trenching the ground to the depth before specified (eighteen or twenty inches) in the operation of taking up the roots, which prepares it for another sowing. As the roots are lifted, I place then in a frame, previously prepared with a slight hot-bed for their reception, beginning at the back with the first row; putting some fine earth firmly about the roots, and so proceed until the frame is full, leaving the heads just above the surface; after which

I put on the lights, and let it remain for a week or ten days, until all danger of over-heating is past. Then I take off the lights, and cover the surface of the bed with leaves, to the depth of four or five inches; adding more as I find the heat decrease, until the frame be nearly filled to the glass. If all has gone well, the sea-cale will be blanched and fit for use in three weeks, or a month at the furthest, from the time the roots are put into the frame. The retaining as much earth to the roots as possible at the time of lifting, I at first considered an object; but from experience I find it is of little consequence, provided the mould is made firm about the roots, at the time they are placed in the frame.

The certainty of having this vegetable fit for use at any particular time it may be required, is an important object with many. Therefore to such I would recommend this as a certain way of procuring it by any time that may be wished. The saving of *labour* and *dung* by this mode of treatment, must appear obvious to every practical gardener, when he considers the difficulty attending the keeping up a proper and regular degree of heat, by covering with dung over pots, and other similar methods, (as generally practised,) at so inclement a season of the year; requiring three times the quantity of dung to produce an equal number of heads, to what will be necessary when the roots are placed in a frame; for a

common melon frame will contain as many heads as are capable of being produced in two drills of twenty yards each, by covering with hot dung.

To keep up a regular succession, I find two frames of three lights each, quite sufficient for a large family; the first prepared about the beginning of November, and the second about the last week in December; and by the time the second frame is exhausted, sea-cale will be ready for use in the open ground, where it had the thickest covering of leaves in autumn, and so on in rotation, as the beds have had less or more covering applied to them. The last cutting will be from what was sown the spring before.

Some may object to blanching the one year old plants; but I am induced to think they are not the least injured by it, for the slight covering that is given them, is only a requisite protection to them during the winter; and as they come in much later in spring than the old established roots, the season for this vegetable is prolonged a fortnight or more, and thus it is only making use of what it would otherwise be requisite to throw away; for if the young plants are suffered to remain with their flower-stems upon them, (which they seldom fail to produce,) it tends much to weaken, if not entirely destroy them. If, therefore, they are not blanched, they should be divested of the flower-stem, and this causes them to form a good stool for future produce.

Although the sea-cale is by no means a delicate plant, I find it is much benefited in the open ground by a slight protection during severe frosts, and particularly such as we have experienced the last winters, (1813, 1814); during which, although uncommonly severe, I had not the least difficulty in affording a regular supply of this vegetable, by the method I have here endeavoured to describe.

BOTHWELL CASTLE,
3d March 1814.

XI.

Remarks on French Pears.

By Colonel Spens of Craigsanquhar.

In a Letter to Sir G. S. Mackenzie, Bart.

(Read 13th September 1814.)

Dear Sir,

Sensible how desirous you are to encourage any attempts which may be made to forward the views of our Society, I venture to submit to you some ideas and hints respecting fruit-trees, which, should you think meriting any notice, I request that you will have the goodness to lay before the Council for their consideration.

In the finer and later kinds of pears, particularly the French, commonly cultivated in this northern region, I think, that it may admit of a doubt, whether we have been guided by a thorough knowledge of the habits of the different sorts, or whether we have not rather been more influenced in our choice by the goodness of the fruit itself, than by the sure bearing of

the tree producing it, or by its being well adapted to our cold and invariable climate. Aware that these kinds of trees often disappoint the hopes of the horticulturist, the Society have very properly offered a prize " For the best means of bringing into a bearing-state, full grown fruit-trees, (especially some of the finer sorts of French pears,) which, though apparently in a very healthy and luxuriant condition, are yet in a state of almost total barrenness." This, I think, has produced a very good paper from Mr James Smith, Ormiston Hall, page 74. No. 1. of our Memoirs. Yet I am inclined to believe, that to the several causes to which he has assigned our frequent want of success, a very strong one might be added, namely, the *shy bearing* of several of those sorts to be found in general in our gardens. Now, if I am correct in this idea, I apprehend, that no attempts which may be made,—no pains or attention which may be bestowed, can, at least with respect to them, remedy the evil complained of. Bad management of many kinds, may render and keep a tree unproductive, which yet may again be made fruitful, by proper skill and better treatment. But what remedy can be applied to a tree naturally a shy-bearer ? In my humble opinion none.

This leads me to suggest to the Society the expediency of calling for communications on the history and habits of the finer sorts of French pear-trees usually cultivated in this country, found-

ed on long experience gained in Scotland, in order to ascertain whether or not they be shy-bearers, and whether many of them may not require more sun to ripen their fruit than our seasons in most years will afford. Inquiry may also be made after other kinds more to be depended on; and besides offering prizes for new varieties to be raised from seed, attempts might be made to bring into notice any good late pears not generally known, fit either for the table or the kitchen, and to recover such kinds as may have formerly been successfully cultivated in any of the fruit districts in Scotland, but which are now apparently lost to us.

Accompanying this, is a list of some winter pears favourably mentioned by various authors, about which the Society may, if they think proper, inquire; some of them are French, others said to be Scotch. As far as I know, our number of Scotch winter pears is scanty indeed; and if three cannot be recovered, particularly recommended by Dr Gibson, in his Fruit Gardener, and included in my list, I believe we have not above five more to depend on: which are the Swan Egg, Achan Brier-bush, and John Monteath; and to them I am inclined to add the Muirfowl Egg, which, at least with me, keeps much longer than the Swan Egg, and at Craigsanquhar must be reckoned a winter pear, though, wherever I have seen it mentioned, it is set down as an autumn fruit. The Swan

Egg has never kept good here beyond the end of November, whereas the Muirfowl Egg has sometimes remained in good preservation till towards the end of April. This last season (1813) they were taken from the tree sooner than usual; therefore, were earlier ripe or fit to eat, and consequently have decayed sooner than ordinary. They were perfectly good till towards the end of January 1814, after which they spoiled very suddenly. I may also, with great safety, allow the Muirfowl Egg to remain on the tree ten or twelve days longer than the Swan Egg; the leaves also of the latter fall much sooner than those of the former.

In a walled garden, many must be at a loss to know what kinds of trees to plant on the different aspects, so as to secure the probable chance of a fair crop, in tolerably favourable seasons. If application be made to the catalogues of nurserymen, who, in their descriptions, must of necessity be very concise, or if books on gardening be consulted, (the authors of which, I am afraid, often, without inquiry, copy from their predecessors), they may be misled, or at least not get all the information necessary to enable them to make a judicious and prudent selection. For instance, they will find it mentioned, that the Cressanne, the Colmar, the Boncretien d'Hyver, the Chaumontelle, &c. are excellent pears, which is certainly very true; but they may not also be told, that

some of them are shy bearers, and that others of them, except in most favourable situations and seasons, do not ripen in this climate,—intelligence, which very probably would have led them to choose, or to inquire after other sorts, better suited to our northern region.

In a garden possessing very great advantages with respect both to soil and situation, the finer and later sorts of French pears may reasonably be attempted, or in one very extensive, much exceeding the usual size, the proprietor may indulge in them, because, the great number of trees which he can command, may make up for the scanty produce, which each may yield to him. But in one of the common extent, and with no extraordinary advantages of soil and situation, it is of particular consequence to know, and to be contented with those kinds, which are ascertained to be generally productive.

If people are exposed to err from want of the necessary information to guide them in a selection of trees suited to the different aspects, and adapted to the climate, and, reasoning from my own experience, I must conclude many are misled, our Society might do an essential service, by calling for papers on this important subject, founded on the actual experience of years; and I think that it would be requisite that these communications should be requested from different districts, from regions high and low, that in general every

one might obtain the information adapted to his particular situation.

I know that the Society is very sensible of the confusion and disappointment arising from different names being often given to the same fruit by different gardeners, and though the beautiful work which you inform me is now carrying on in London, the *Pomona Londinensis*, may, in a great measure, remedy this evil, and therefore perhaps supersede the necessity of our attempting any thing to the same extent, yet I humbly conceive that it might be advisable in our Society to publish a *Pomona Scotica*, with coloured plates, and that either separately, or periodically, in the different numbers of our Memoirs as they come out. I cannot of course know what steps the composers of the London work may have taken to get a correct history of the Scotch fruits, yet I think that some of them will elude their search or escape their notice.

I am, &c.

P. S. *The following Winter Pears are favourably mentioned by various authors.*

No.

1. Ambrette. French. Recommended as a great and sure bearer, by Switzer and Dr Gibson.
2. Bessi de Quessoi, or Cassoi, or Little Winter Beurré. French. Mentioned by Mr Miller and others, as a prodigious bearer.

3. St Germain's. French. Very favourably spoken of by many authors; but it must be noticed, that there are at least two varieties of it. See a paper in the Transactions of the London Horticultural Society, p. 226. Part 5th, Vol. I. See also Mr Forsyth's List of Pears commonly Propagated in England, No. 68. p. 89. of his book *.

4. Round Conical Pear. Scotch.
5. Round Winter Pear. do.
6. Oblong Round Winter Pear. do.

} particularly mentioned by Dr Gibson, in his Fruit-Gardener, p. 334.

7. Pow Megg. Scotch, I suppose, No. 19. in the list of standard pears in Messrs Machray and Gorrie's Account of the Orchards in the Carse of Gowrie, but whether for the table or the kitchen is not mentioned, nor is it described.

8. John Monteath. Scotch, I presume. A very fine Winter Pear, either for a standard, or a wall, which it deserves.

* The true St Germain is figured in the *Pomona Londinensis*.

XII.

On the Utility of Hot-Walls.

By Mr David Trotter, Gardener, Alva.

(Read 14th June 1814.)

The purport of this paper, is to turn the attention of the Society to the usefulness of hot-walls, for bringing the choicest fruits to maturity. Every one conversant in gardening knows, that in our northern climate, good crops on common walls are precarious. Our springs are so unfavourable to the tender flowers as they expand, that they are in great danger of being destroyed; to prevent which various are the modes adopted to shelter them from the chilling blast, such as coverings of canvas, mats, nets, and branches of trees. Yet it hath often been found, that these covers have not had the desired effect, when the weather proved cold and wet. The reason is obvious; the tender parts of fructification are destroyed by the wet lodging among them, and by the coldness and density of the atmostphere, keeping them inactive; and some

of the covers thus used, are the means of retaining the wet longer on the tree, which of course must be hurtful. But supposing we have been fortunate enough to escape the perils of the spring, and a fair crop of peaches, nectarines or apricots, are set and swelling, then our hopes are elated; we look forward with assurance for perfect fruit in their season: if, however, a wet September sets in, cold and long nights are increasing, our peaches and nectarines are ripening, but how insipid! Our Moorpark apricots, which, by many connoisseurs, are accounted the best of all stone fruit, are only soft on one side; and if you let them hang until they approach to mouldiness, the other side will still be hard, and the juices not properly refined. What a mortification is here! How are our hopes blasted! What a poor recompence for all the expence, care and anxiety they have cost us! And this it not only the case in some bleak situations, but also, in some seasons, in the most sheltered spots.

Now, to obviate these disappointments, and to insure to every proprietor of a garden, an annual crop of well matured peaches, nectarines or Moorpark apricots, I bring forward to your notice a flued-wall, which, in my opinion, is the greatest acquisition to a fruit-garden, in such a climate, inasmuch as the fruit are generally found to be superior in flavour, to those on any other situation. When we likewise consider that no danger

is to be apprehended from the severity of the spring months, even when exposed to all sorts of weather; every kind of covering being superseded, by the genial heat of the wall*, and this I have long experienced, even in England, but especially in Scotland, to be the best preservative of the blossom and young fruits. But I shall relate my practice in this branch of horticulture, since I came to this place.

In the end of May 1808, I came to Alva, and found the peach and nectarine trees on the hot walls in a bad state: they had made luxuriant shoots in the former year, but these were not ripened, and had been allowed to ramble to the top of the wall, without any regard to the filling up of the tree. The aphis had devoured every leaf of them, a few curled ones excepted. In the first week of June, I cut them well down, so as to fill the heart of the tree with young wood, and as they grew luxuriant, I applied gentle fires through the night early in August, and continued strength-

* This, it may be observed, is in opposition to a late writer, who treats the idea of making a climate for a tree on a flued wall, as 'ridiculous.' All I shall say at present is this, that he seems to have written upon what he did not practically understand.

ening them as the nights lengthened, until I completely ripened the wood. As soon as the blossom began to open in the following spring, I put on the fires, and kept the wall in a state for repelling frost, and evaporating the wet that might fall upon it; and this is done, by making the wall agreeable to the feel, when you place your hand upon it. The first or lower course of flue, especially near the fire-place, if not carefully worked, will sometimes get too hot: to prevent any accident, therefore, from burning, place a trellis along the first flue. I continued the fires until the fruit were set, and the danger of frost over. I commenced fires again in the end of August, to bring my fruit and wood to maturity, and had an excellent crop of high-flavoured fruit in September and October, and even some very good Teton de Venus peaches to the middle of November. The fires were continued until the leaves parted easily from the trees. In good seasons, little fire is required to ripen the wood.

I have thus given you my mode of using the hot wall. I never fail of abundant crops, and as high flavoured as I have seen them in England. The trees enjoy the treatment, and have clothed the wall so well, that I can hardly put my hand on a naked spot.

The superiority of heated air in the walls, to all sorts of covering for the preservation of blossom and young fruit, appears to be, that the heat being uniform and continued, keeps vegetation in a regularly progressive state, whereas, without this uniformity, it is checked, chilled, and often destroyed.

In the year 1810, I had great complaints that we never had a good Moorpark apricot in the garden. My opinion was, that in our situation, (being an elevated one, on the side of the Ochil Hills,) we never could have a good one, unless assisted by a fluid wall. I therefore recommended one; and my advice was taken. In March 1811, I took my apricot trees off the wall, and put them carefully in by the heels in a secure place of the garden; the workmen then pulled the face of the wall down, and the heart too, which was easily done, as it had not been well put together. They left the back outside course standing from top to bottom. The wall is twelve feet high: it was taken down about forty feet of a stretch at a time: to have gone further, was thought dangerous, as it might have brought down the back course. We flued for four fires, allowing 500 square feet for one fire; we made four flues in the wall, the first three feet deep, and led it along two bricks above the border; the second divided from the first by two course of bricks; the third and fourth by

one only, and proportionally decreasing in depth as they ascended, leaving two course of brick of solid work at top, for binding the wall more firmly together. It may here be proper to advert to an error which I have often observed in hot walls; it is this, the furnaces are placed too close upon the wall, and the flues lead directly forward to the front; whereas, the furnaces should be kept back, and the flues should sweep along five or six feet, before they reach the front brick: this would prevent burning.

The usual work of the garden prevented me from having the border prepared for the reception of the trees until the middle of July: I then planted them, and gave them a hearty watering; and as the weather was dry, I watered them every day with the engine, and gave them more or less at bottom as I saw needful. In the course of a month, I observed them establishing themselves, and had the satisfaction in autumn, to see them all in a growing state. They stretched in general from ten to twelve feet on the wall. As the season was far advanced, much ripe wood could not be expected; however, the fires were applied in the night to harden them as much as possible: it so far succeeded, that many of the studs or spurs, and short shoots, were ripened.

In spring 1812, when the flowers began to open, I put on the fires to preserve them from the

weather, and to encourage the trees to make good wood. The produce of this year was a few well ripened fruit on most of them, and good wood on all of them.

In spring 1813, when the blossoms began to expand, the fires were applied as usual, and continued until the dangerous season was over. The produce of this year was a plentiful crop, of well swelled and high flavoured fruit, which came in at an early season; the best of them being over before the September meeting of the Horticultural Society took place.

A person unacquainted with a flued wall uncovered, may feel alarmed for his crop, when he sees the snow beating against his trees in flower; but he has nothing to fear, if he keeps a steady warmth in the wall, which is easily done. My situation is much exposed. What is termed a "strong gale" on the plain, is often "a tempestuous whirlwind" here. Last spring, the finest show of currants that I ever saw, with every leaf on them, were destroyed by a storm and frost, on an espalier rail not more than ten yards from the hot wall; yet all was safe on it.

The expence of fuel to a hot wall is trifling. For four fires, I have used little more then the cinders sifted fron the ashes made at the house, and the small coal, the refuse of the coal cellar.

Thus, every admirer of fine fruit, may see how certainly and easily he can have them in Scotland, as well as in England.

I have also planted figs against a hot wall, where I expect to have them better than in the houses, for I have had them so in England.

ALVA GARDENS,
28th February 1814.

XIII.

On protecting Trees and Shrubs from the attacks of Hares *.

By Mr Robert Elliot, Gardener, Castlecraig.

In a Letter to the Secretary.

(Read 13th December 1814.)

Sir,

I have for some time past had it in contemplation to submit to the members of the Caledonian Horticultural Society, my method of protecting fruit and forest-trees, and also shrubs, from the attacks of hares in the winter season.

Take three pints of melted tallow to one pint of tar; mix them well together, over a gentle fire. In the month of November, take a small brush, and go over the rind or bark of the trees with the mixture, in a milk-warm state, as thin as it can be laid on with the brush. I have found that such a coating does not hinder the juices or

* See Vol. i. p. 361.

sap to expand in the smallest degree; and I have proved the efficacy of this plan, in preventing the attacks of hares, by applying the liquid to one tree, and missing another; when I found the latter was attacked, and the former left. Five years experience have convinced me of its efficacy. The trees that I went over the first two years, I have not touched since; and not one of them has been injured by the hares. I think, if all the bark is properly gone over with the mixture, they would not need any more for some years.

The neatness that attends this method, in the appearance of an orchard, instead of having the trees all covered round with straw-rops, or small stakes, is another recommendation of it.

As to the time required for making the application of the mixture, in the manner above mentioned, a man might go over five hundred trees in a day, if they are of small size.

This mode is particularly adapted for nurseries, where the ground is not well secured with a fence, to protect the young fruit-trees and tender shrubs from hares.

For whatever extent of trees the mixture is to be made, three parts of tallow, and one of tar, are the proper proportions. I am, &c.

CASTLECRAIG,
1*st August* 1814.

XIV.

An Essay on the Management of Bees, with an account of some curious facts in their History.

By Dr James Howison of Hillend.

(Read 13th December 1814.)

It being my intention to describe to the Society the management of a single hive of bees, from their swarming until they themselves have sent forth their first colony, I shall remark on the different operations, as they naturally succeed each other, according to the method now in general use; leaving that followed by me, of taking the honey without killing the bees, to be explained under a distinct head.

Variety of Bees.—To the common observer, all working bees, as to external appearance, are nearly the same; but to those who examine them with attention, the difference in size is very distinguishable; and they are in their vicious and gentle, indolent and active natures, essentially different.

Of the stock which I had in 1810, it required 250 to weigh an ounce; but they were so vicious and lazy, that I changed it for a smaller variety, which possesses much better dispositions, and of which it requires 296, on an average, to weigh an ounce. Whether size and disposition are invariably connected, I have not yet had sufficient experience to determine.

Materials and Size of Hives.—Hives made of straw, as now in use, have a great advantage over those made of wood or other materials, from the effectual defence they afford against the extremes of heat in summer, and cold in winter. That the hives in size should correspond as nearly as possible with that of the swarms, has not had that attention paid to it which the subject demands, as much of the success in the management of bees depends on that circumstance.

From blind instinct, bees endeavour to fill with combs whatever hive they are put into, before they begin to gather honey. Owing to this, when the hive is too large for its inhabitants, the time for collecting their winter store is spent in unprofitable labour; and starvation is the consequence. This evil also extends to occasioning late swarming the next summer; it being long before the hive becomes so filled with young bees as to produce a necessity for emigration, from which cause the

season is too far advanced for the young colonies to procure a winter stock.

I should consider it as a good rule in all cases, that the swarm should fill two-thirds of the hive. The hives used by me for my largest swarms, weighing from five to six pounds, will contain two pecks measure of corn, and will yield, in a good season, eight Scots pints of honey, and for smaller swarms in proportion. Hives with empty combs are highly valuable for second swarms, as the bees are thereby enabled much sooner to begin collecting honey.

Situation for Hives.—That the hives should be so placed as to receive the rays of the rising as well as meridian sun, is of considerable importance; heat and light appearing the principal stimulants to the action of bees. A hive so situated as not to be touched by the sun until some hours later than the other hives in the same garden, would in the course of the season lose a proportional number of days labour. Hives should stand at some distance from walls and hedges. When lately building a garden-wall, with a good exposure for bees, I ordered a number of niches to be made, into which I afterwards put hives. These were, however, so much infested with snails in summer, and mice in winter, that I was under the necessity of removing them to a more open situation.

Feeding of Bees.—Near the sea, little honey is collected after the first week in August; but in high situations, where the flowers are later, and heath abounds, the bees labour with advantage until the middle of September. These are the proper periods, according to situation, for ascertaining if the hives intended to be kept contain a sufficient winter stock. The killing of the drones, (a very singular fact in the history of the bee, and which will be noticed hereafter), perhaps marks this time with more precision.

If a large hive does not weigh thirty pounds, it will be necessary to allow it half a pound of honey, or the same quantity of soft sugar, made into a syrup, for every pound that is deficient of that weight; and, in like proportion, to smaller hives. This work must not be delayed, that time may be given for the bees to make their deposit in their empty cells before they are rendered torpid by the cold.

I must here notice, that sugar simply dissolved in water, (which is a common practice,) and sugar boiled with water into a syrup, form compounds very differently suited for the winter store of bees. When the former is wanted for their immediate nourishment, as in spring, it will answer equally as a syrup; but if to be laid up as store, the heat of the hive quickly evaporating the water, leaves the sugar in dry crystals, not to be acted upon by the trunks of the bees. I have known

several instances of hives killed by hunger, while some pounds weight of sugar in this state remained in their cells. The boiling of sugar into syrup forms a closer combination with the water, by which it is prevented from flying off, and a consistence resembling that of honey retained. I have had frequent experience of hives not containing a pound of honey, preserved in perfect health through the winter, with sugar so prepared, when given in proper time, and in sufficient quantity.

Covering the Hives.—Bees are evidently natives of a warm climate, a high temperature being absolutely necessary to their existence; and their continuing to live in hollow trees during the severe winters of Russia and America, must depend on the heat produced from the great size of the swarms which inhabit these abodes. From my own observation, the hives which are best covered during winter, always prosper most the following summer. In consequence, about the end of harvest, I add to the thin covering of straw put on the hives at the time of swarming, a thick coat, and shut up the aperture through which the bees entered, so that only one can pass at a time. Indeed as a very small portion of air is necessary for bees in their torpid state, it were better, during severe frosts, to be entirely shut up, as numbers of

them are often lost from being enticed to quit the hive by the sunshine of a winter day. It will, however, be proper at times to remove, by a crooked wire or similar instrument, the dead bees and other filth, which the living at this season are unable to perform of themselves.

To hives whose stock of honey was sufficient for their maintenance, or those to which a proper quantity of sugar had been given for that purpose, no further attention will be necessary, until the breeding season arrives. This, in warm situations, generally takes place about the beginning of May, and in cold, about a month after.

Owners of hives are often astonished, that, at this advanced season, when their bees had, for weeks preceding, put on the most promising appearance, after a few days of rain, they become so weak and sickly as to be unable to leave the hive, and continue declining until they at last die.

From paying attention to this subject, I am convinced, that the cause is as follows: The young bees, for a short time previous to their leaving their cells, and some time after, require being fed with the same regularity that young birds are by their parents; and if the store in the hive be exhausted, and the weather such as not to admit of the working bees going abroad to collect food in sufficient quantity for themselves and their brood, the powerful principle of affection for their young

compels them to part with what is not enough for their support, at the expence of their own lives.

To prevent such accidents, I make it a rule, that if, during the breeding season, it rain for two successive days, to feed all the bees indiscriminately, as it would be difficult to ascertain those only who require it.

Of Swarming.—For several years past, my hives have uniformly sent forth their first swarms during the second week in July, from which it appears, that early or late swarming *in the same situations* is not so much regulated by good or bad seasons, as might have been expected. Near the sea, this will, of course, take place some weeks earlier.

The first swarming is so long preceded by the appearance of drones, and hanging out of working bees, that if the time of their leaving the hive is not observed, it must be owing to want of care. The signs of the second are, however, more equivocal, the most certain being, that of the queen, a day or two before swarming, at intervals of a few minutes, giving out a sound a good deal resembling that of a cricket. It frequently happens, that the swarm will leave the old hive, and return again several times, which is always owing to the queen not having accompanied them, or from having dropt on the ground, being too young to fly to a distance. In such cases, I have seen her found near to the old hive; and on being taken up and

placed in the new one, the swarm instantly settled.

Gooseberry or currant bushes should be planted at a short distance from the hives, for the bees to swarm upon, as, by attending to this, I have not lost a swarm by straying for several years. This, I am however convinced, depends much on the nature of the bees which form the stock. When a hive yields more than two swarms, these should uniformly be joined to others that are weak, as, from the lateness of the season, and deficiency in number, they will otherwise perish. This junction is easily formed, by inverting at night the hive in which they are, and placing over it the one you intend them to enter. They soon ascend, and apparently, with no opposition from the former possessors, as I have never observed fighting to be a consequence.

It being very universally believed, that two queens cannot live together in the same hive, I have for several days after this forced junction, searched for the murdered queen, but never with success. Should the weather, for some days after swarming, be unfavourable for the bees going out, they must be fed with care until it clears up, otherwise the young swarm will run a great risk of dying.

Method of obtaining the honey without killing the Bees.—The Society will see, from the peculiar

structure of the hive *, with which I accomplish this object, that I was under the necessity of making it of wood, in place of straw, which, for the reasons before given, I should have preferred.

It consists of two distinct hexagons, one placed above the other. The under is formed of six panes of half inch deal, each measuring ten inches in width, and eight in depth, and covered with a thin board at top. This forms a box that will contain two pecks measure of corn, and which, I consider, as sufficient for the largest swarm. This is intended for the breeding, as well as winter habitation of the bees. The upper is of the same dimensions and form as the under at bottom, but in order to give it a conical shape, for the more conveniently fixing thereon a coat of straw, the panes at top are only five inches wide, which is also covered by a piece of board. The upper box has a moulding fixed to its under part, which projects about a quarter of an inch, and so exactly embraces the upper part of the lower box, as to join these two firmly together. In the deal which forms the top of the lower box, are cut four oval holes, each one inch wide, and two inches long, through which the bees pass into the upper. This communication, when not wanted, is shut by a board, which moves on a nail in its centre. The small pane of glass in the top of the upper box, admits of seeing

* Plate II.

the progress the bees have made in it, without separating it from the lower one.

When the swarm is first put into the lower box, the communication is shut with the upper, until the bees have completely filled the lower with combs. The communication is then to be opened, when the bees will ascend, and if the season is favourable, and the swarm numerous, they will fill it also, but not until they have completely stocked the lower. By removing the straw covering, and looking through the glass in the upper box, it may be seen what honey has been collected. Should a part or the whole of it be wanted, it will only be necessary carefully to separate the upper from the lower box, and shut the board of communication. The upper box is then to be removed to some distance, and the bees contained in it, driven off, on which they will immediately join their companions in the lower. So soon as the honey is taken from the box, it can be replaced, and if early in the season, the communication opened for making more honey, but if late, it must be kept shut until the hive has swarmed next summer. If honeycomb early next season is preferred to a swarm, then the communication must be opened about the beginning of June.

All the honey procured in this way is remarkable for its purity, none of the cells having been ever polluted by the hatching of young bees.

The greatest advantages, however, from this method, are the early and large swarms,—the consequence of not killing the bees.

Conclusion.—I shall conclude this essay with some curious facts in the history of the bee, which presented themselves to my notice during the management of this singular insect.

1st, I have frequently observed, that, during swarming, the twig or branch which supported the swarm, weighing from five to six lb., or 30,000 bees, had its surface completely covered with the first 300 or 400 that alighted upon it, the remainder of the swarm having their whole weight supported by that small number, which, in any other situation, must have torn them to atoms.

2dly, That light is not necessary to the labour of bees, or if it is, it must be in a degree incomprehensible to us. The passage to the abode of the humble bee, is often a zigzag several yards in length, through which it appears impossible for any light to pass.

3dly, Bees are entirely directed to their food by smell, as appears from the following experiment. I placed in a tea-kettle a cloth, through which I had strained some honey, and after fixing the lid, I put it on the ground about 200 yards to windward of some hives. I was soon after much amused in seeing a number of bees following the different windings of the scented breeze, until

they reached the spout of the kettle, which they immediately entered.

4*thly*, Killing the drones by the working bees, when the breeding is at an end, is performed in a singular way, and done by one bee in general. It almost uniformly fixes on the drone, at the insertion of the left wing, when it tears with its fangs the muscle which moves the wing, so that when thrown from the stand of the hive, it cannot again rise, and is usually killed by the cold of the following night. No stinging or other violence is ever used; and although the drone is four times the size of his executioner, no attempt at retaliation is ever offered.

XV.

Hints on the Processes of Wine-making.

By Dr MacCulloch, Woolwich.

In a Letter to Mr Neill, Secretary.

In compliance with the wishes of some of the members of the Caledonian Horticultural Society, I have attempted to sketch the general principles and practices used in the manufacture of wine, with a view of assisting the efforts of those whom the Society, by its annual premiums, has encouraged to cultivate the art of making this liquor from fruits of domestic growth.

In laying down these rules, and in describing these usages, I have been chiefly careful in selecting, and solicitous in enforcing those which could most readily be brought to bear on our domestic manufacture; being desirous rather to point out such analogies as were applicable to the practices which the Society has so laudably patronized, than to enter either into the chemical history of this most interesting process, or to give a detailed

account of the art, as it is practised in those more favoured climates, where the grape is the sole fruit in use for this purpose. The magnitude of the subject, would have otherwise led me into discussions, of a length incompatible with the limits of the Society's publications. In condensing and abridging the materials originally collected for this purpose, I have perhaps reason to fear, that I have omitted matters essential to the perfect understanding of the subject. Yet I hope that I have not neglected any thing which will prove a material want, in reducing to practice the views which I have held out, and that some light, however feeble, will be afforded to those, who have hitherto been guided by rules of a dogmatical and positive nature.

It is evident, that, in the complicated process of fermentation, some rules should be laid down as the foundation of our proceedings, and the test to which we must have recourse in examining the accuracy of our manipulations. I cannot too strongly enforce the necessity of familiarizing ourselves with *general principles*, which alone can assist us through the obscure paths, which this, as well as every art connected with chemistry, is obliged to pursue. And it is the address displayed by the artist in converting these general principles to his changing processes, that will give him a certain pre-eminence over those who are governed by invariable rules. In fact, however these

rules may appear fixed, they cannot be generally applied, because, under the mutable circumstances in which the application is made, they must frequently be rendered futile, and sometimes even injurious.

The constituent parts of the fruits used in the experiments now under consideration, are malic acid, either in a state of purity, or one of combination with potash, (a circumstance not yet perfectly ascertained); vegetable mucilage, or extractive matter; super-tartrite of potash; sugar; water; the sweet principle; the colouring principle; tannin; super-oxalate of potash; and the principle of flavour. The proportions of these vary much in different fruits, and it sometimes happens that one or more of them is entirely absent. In the white currant, for instance, the colouring substance is often deficient; whilst it abounds in the elder-berry and red grape. So the super-oxalate of potash is rarely found; and, on the contrary, those salts to which the tartarous, or malic acid appertain, are more frequent. So likewise, the sugar is much less abundant than the sweet principle, which is indeed the general cause of the sweetness of the greater number of our fruits. The vegetable mucilage is, if any, the only principle whose presence is invariable, and this principle is one of the most essential in the fabrication of a vinous liquor, as we shall see hereafter. The main diversities of character, in the products of the various fruits, is owing to the varying pro-

portions of the several ingredients which they contain. It is true, that difference of management may produce different effects; but no contrivance can give to the gooseberry the constituent elements of the grape, nor can any mode of procedure extract the flavour of champaigne from the juice of gooseberries, although many, who have not been much accustomed to the flavour of the foreign wine, have been deceived by that made from our humble fruit.

Among the principles enumerated, tartar, water, sugar, the sweet principle, and the vegetable extract or mucilage, are the most essential in the conversion of fruits into wine. Colour and flavour may be considered as adventitious; and the principles which yield them, are in nowise essential to the process of wine-making. The effect produced by the super-oxalate of potash is unknown, as it has not been the subject of experiment.

Tartar, however, seems essential to the formation of a genuine vinous liquor; and an addition of it where it is naturally wanting, is found, not only to ameliorate the produce, but even to increase the quantity of alcohol, which a given proportion of sugar and the vegetable extract is capable of producing. Fermentation is more easily induced where this salt is present; and the experiments of some of the French Chemists, seem to shew that it is decomposed during this process. Their opinion, that it

is converted into the malic acid is questionable. The presence of tartar is the circumstance which most strongly distinguishes the grape from all the fruits which have been applied to the making of wine. In this fruit, it exists in the greatest quantity before ripening, and a portion of it disappears during this process. From this peculiarity of the grape, the practice has been introduced of mixing tartar with those washes, which makers of *sweets* intend for the basis of their wines; and from it I have also derived the practice of mixing tartar with those native fruits which are deficient in this substance; a practice which has been attended with the best results. The details of this practice will be treated of hereafter in their proper place.

The effect of the *malic acid*, another of the enumerated ingredients in fruits, is very different from that of tartar, inasmuch as it has been found injurious to the fabrication of wine. It is remarked, that all wines which abound in malic acid are of a bad quality, although in many cases it has not been determined, whether this acid was an original ingredient in the fruit, or whether it was not generated during the process of fermentation.

In either case, since its existence in wine is found to be injurious, it is important to attend to this fact, as our native fruits seem all to be characterized by an excess of malic acid. This is perhaps one of the most fundamental and least corrigible defects in our domestic wines. To render the nature of this

defect more obvious, it must be remarked, that the essential distinction between cider and wine, consists in the quantity of malic acid which enters into the composition of the former. From this cause our native wines are more apt to partake of the nature of cider than wine, although these are often rather disguised than changed by the predominance of undecomposed sugar, of brandy, and other foreign matters which enter into their composition.

It is a question worthy of consideration, whether some chemical means might not be adopted for destroying a portion of this acid, either before or after the process of fermentation. In the manufacture of sherry wine, lime is added to the grapes before this process is commenced. However empirical this practice may be among the manufacturers, it probably acts by neutralizing this acid, as well as a portion of the tartarous acid, and to this is probably owing the peculiarly dry quality of that wine. A hint may probably be borrowed from this practice towards the amelioration of our domestic wines; and I may here venture to point it out as a practice worthy of imitation,—worthy at least of a careful trial. It is only from the results of such, and similar experiments, that we can hope ever to place our domestic manufacture on a sound and rational basis.

Of all the substances which are called into action, during the process of wine-making, *Sugar* must be considered the most essential, being that

on which the strength of the wine depends. Those fruits which contain the greatest proportion of sugar, furnish the strongest wine; the alcohol generated in the act of fermentation, being always found to bear a proportion to the pre-existing sugar. The principal defect in our domestic fruits is the small proportion of sugar which they contain; but it is at the same time that which we are most easily able to remedy; and it is on this basis indeed that the whole system of our domestic wine manufacture is founded. But even in this part of the process difficulties occur, and lead to the imperfect fermentation of these wines, and the consequent sweetness by which they are too often characterized. The saccharine matter has indeed been considered as existing in two distinct states in vegetables, that of pure sugar and that of the sweet principle; but it is perhaps more correct to consider sugar as an artificial substance formed by chemistry from the sweet principle, the only state in which sugar truly exists in vegetables. The sweet principle is characterized by its want of tendency to crystallize, and by the facility with which, on the addition of water, it runs into fermentation. Sugar, on the contrary, is crystallizable, and has no tendency to ferment, except in as far as it contains a portion of the sweet principle, or of that peculiar substance by which this principle is distinguished from sugar. If a solution of pure sugar in water be allowed to repose, it

crystallizes without fermenting; nor does even the residuary syrup, or mother water as it may be called, undergo this process. But if it has been imperfectly refined, the remaining syrup, will, after the deposition of the crystals, contain so large a proportion of the sweet principle, that it will readily run into fermentation; an accident well known to confectioners. The juice of the sugar-cane readily allows of the separation of the sugar from the sweet principle, and has hence become the almost exclusive subject of this manufacture. The residuary matter, known by the name of Molasses, is the sweet principle of the French Chemists, and is a peculiar compound of sugar, with vegetable extractive matter, similar to that which exists in the generality of sweet fruits. In considering this substance, therefore, it will be most consistent with the accuracy of chemical language, to speak of it as a peculiar compound of sugar and vegetable matter, and not to consider it, with Deyeux, Proust, and Seguin, as a simple substance. Hence we should not say with these chemists, that in some fruits, and in some varieties of the grape, sugar predominates, and in others, the sweet principle; but that the sugar of the fruit is in some cases combined with more, and in others with less of the vegetable extract. These varying proportions of the two substances under consideration, are the cause of the various effects, which are observed in the results of fermentation in different fruits. If

the sugar predominates, the wine will be sweet, unless expedients are used to complete the fermentation of the sugar, and convert the whole into wine. If the sweet principle is most abundant, or, to speak more correctly, if there is much vegetable extract combined with the sugar, the fermentation will be complete, and the wine dry, unless artificial means, hereafter to be described, are used to prevent this effect. The distinction which I have here drawn, though appearing to partake of unnecessary refinement, will be found to lead to practical utility.

Among the enumerated ingredients of fruits, the *vegetable extract* naturally falls next under consideration. Although this substance has not been analyzed, we know that it differs from mere vegetable mucilage, by containing azote, or a substance which on decomposition produces it, since azotic gas has been detected in the produce of fermentation, both in an uncombined state, and in one of its most frequent combinations, forming ammonia. These substances are known to exist in yeast, which is a modification of the vegetable extract. In many vegetables, and conspicuously in the gluten of wheat, it exists in great proportion. It is for this reason that wheat as well as rye, act powerfully as ferments. It is also found in many flowers, in that of the elder for example,—in the leaves of the vine,—in the

grape,—in the gooseberry, and in many other fruits as well as leaves. It is observed to abound in those vegetable juices which gelatinise on boiling. This substance, then, is the true natural leaven of fruits, or that by which the sugar which they contain, is rendered capable of undergoing fermentation: And in the artificial process of vinification, which is the subject of this paper, it is to this substance that we must look for the conversion into wine of that sugar which may enter into the compound.—But I shall have occasion to enlarge on this subject, when I consider the process of fermentation.

Water, enumerated among the principles of fruits, simple as it may appear, is a substance requiring consideration. If the proportion of water be too small in the liquor subjected to fermentation, that process is difficultly either established or maintained. This is a matter of constant occurrence in those countries, when the juice of the grape is boiled to a certain consistence, or when the fruit before pressing, is allowed to undergo a partial desiccation. From these practices, result sweet and half-fermented wines, those of Cyprus and other places, as well as that class of wines known in Italy by the name of *Vino cotto*. The *vina cocta* of the ancients, appear to have been of a similar quality from the same cause. The wines of Tokay and San Lucar, are known to derive ad-

ditional richness and strength, from a moderate use of this practice. This process can be of no use in the manufacture of our domestic wines, nor does the nature of our fruits admit of it. An excessive addition of sugar may produce a similar effect; but I know not that any of the receipts in use, approximate to that excess. That sweetness which is the prevalent fault of our wines, arises from other causes, which I shall consider hereafter.

The fruits of this country possess so little of the three remaining substances which were enumerated as constituents, that it is unnecessary to dwell much on them.

Scarcely any *colour* is contained in our fruits, if we except the black cherry and the elder-berry, and as colour may be considered in the light of an ornament, and is easily procured by colouring ingredients, its want is not to be regretted : the essential parts of wine-making in nowise depend on it.

The *tanning principle*, which is the cause of astringency, is contained in the husks and stems of some grapes, and communicates, at the pleasure of the operator, that roughness known in Port wines. The sloe and damson possess it, but as it can readily be communicated by kino or catechu, and is not a very desirable quality, it is sufficient to have noticed it, considering, as we may, the imi-

tation of foreign wines by circuitous means, as a fruitless attempt.

The last principle, that of *flavour*, is so uncertain and fugacious, that it is difficult to establish any general rules respecting it. In many grapes, as those of Frontignan, the flavour of the fruit is absolutely identified with the wine which they yield; but in all such cases the wine is sweet and half fermented. The finer flavours of the superior wines, those of claret, hermitage and burgundy, bear no resemblance to that of the fruit, but are the result of the vinous process. In the manufacture of many wines, recourse is had to flavouring ingredients, such as orris-root, grape-flowers, almonds, mignonette,—a process which is imitated in this country in the making of elder and cowslip wines. If the flavour of fruits could be transmitted with certainty to the wines, we might expect similar results from the strawberry and raspberry; but the effect of fermentation is generally such as to volatilize or destroy this delicate principle.—Hereafter I shall point out a probable method of attaining this object.

If a knowledge of the circumstances which attend and modify the intricate process of *fermentation*, be necessary in the making of wine from the grape, it is still more requisite to investigate the various accidents and causes which may affect it, when the substances exposed to its action, are, like

those used in our domestic manufacture, artificially compounded. It is thus only that we can hope to establish such general rules, as may be applicable to those ever-varying cases, where particular rules of practice would be unattainable. A general notion has already been given of the substances, to whose mixture the process of fermentation is owing, and the essential ones will be found to consist of sugar, vegetable extract, tartarous and malic acid, and water. These are indispensable, and to their varieties in proportion, some of the most remarkable differences in the results of fermentation will be found owing. Among these, sugar is the most essential, since the alcohol of wine is more particularly derived from the decomposition of this substance. The strength of the wine is proportioned to the quantity of sugar fermented, and the most saccharine juices, therefore, afford the strongest wine, or in the artificial process, if so it may be termed, that compound to which the greatest proportion of sugar has been added, will be capable of giving the strongest, if duly managed. But we have already seen, that sugar and water alone do not ferment, if the sugar be pure, and that this process only takes place in clayed sugars, or in those which contain a portion of that vegetable extract which characterizes the sweet principle. In the juices of fruits, the sugar and extract exist in a state of combination, to which, as I before remarked, the term of Sweet Principle has

been applied. If the juice of the grape, for example, be exposed to heat and rest, a coagulable substance is separated. The juice then ceases to ferment with the same facility, but may again be induced to undergo that change, by a re-addition of a matter similar to that which was separated from it. This matter is found in all vegetables, in some, as in wheat, conspicuously; and it appears to constitute the greater proportion of yeast, as well as of the lees of wine and beer, or other fermented fluids. Here, then, we have the theory of this process, as it is applied to artificial compounds. It consists of mixing with a solution of pure sugar in water, a certain proportion of this unknown substance, which, to distinguish it from common yeast, I shall hereafter call by the name of *leaven*. It is on the proportion, quality and management of the leaven, that the most important consequences in vinification depend. I must therefore describe at more length, the various modes under which it appears.

The natural leaven of fruit is coagulable, and partially separable by heat, but it is not entirely rendered inert. From this cause, as well as from the partial dissipation of the water and concentration of the sugar, boiled juices produce a sweet wine, the process of fermentation being rendered incomplete by a partial separation of the leaven. When the process of fermentation is suffered to proceed in any of the natural compounds formed in the

grape or other fruits, a portion of the leaven is separated from the wine, and is exhibited in two forms of yeast and lee, part rising to the surface in froth, and the remainder subsiding to the bottom of the vessel. It is essential to attend to this distinction, and to understand the true nature of these substances, as some of the most important practices in wine-making depend on it. I must add, that it still remains uncertain, whether any portion of the leaven enters into combination with the vinous produce, or whether it acts solely by exciting the requisite changes in the sugar, and is then finally and entirely separated. The yeast and lee form the artificial leaven, which, in some important particulars, differs from the natural. It is soluble in hot water, whereas the natural is not. But it is insoluble in cold, and it is thus separated by the act of fermentation. I may add, that, notwithstanding the numerous experiments to which yeast has been subjected, its composition, like that of many other vegetable matters, remains obscure. It is important, however, to recollect, that it contains ammonia, or at least the principles of this substance, as Proust has shown. Those who have been engaged in the manufacture of domestic wines, must know, that one of the most frequent defects of these wines, is an ammoniacal taste; and there is little reason to doubt, that it arises from some mismanagement in the process of fermentation, or an improper introduc-

tion of artificial leaven. Although I cannot point out a precise remedy for this evil, these remarks may perhaps turn the attention of wine-makers to search for one.

It will from these considerations be evident, that if certain proportions of sugar and of leaven, whether natural or artificial, be taken, and the process of fermentation be suffered to proceed to its natural termination, the result will be a fluid perfectly vinous, containing neither sugar nor acid, and analogous either to beer or to wine, according to other circumstances hereafter to be considered. If the proportion of leaven be deficient, the produce will contain unchanged sugar; and the same effect will take place, if the fermentation be prematurely stopped by artificial means. If, on the contrary, the leaven is in excess, or the fermentation has been designedly protracted by artificial means, a new product will be formed, and the whole, or a portion of the alcohol, will disappear, and acetic acid will be found in its place. Sweet wine, therefore, is an imperfect wine, or one in which the leaven has borne so small a proportion to the sugar, as to have been incapable of converting the whole into a vinous liquor. This is the case with our domestic wines, when a large quantity of sugar is added to so small a proportion of fruit, that the compound does not contain natural leaven enough to convert the whole into wine. This evil may be corrected by the use of

the artificial leaven *yeast*, but the quantity added is generally inadequate to this object. It is from this cause, that the makers of domestic wines so often attempt in vain to produce dry ones. When this is attempted by diminishing the sugar, the result is a liquor both feeble as a wine, and at the same time, tending strongly to the acetous fermentation. If, on the contrary, recourse is had to an increase of the yeast, the consequence is an increase of the bad flavour, which this substance almost invariably communicates. The true remedy, is so to balance the vegetable juice and the sugar, as to produce a fluid analogous to the juice of the grape, or one in which there shall be a proportion of natural leaven, sufficient to convert the whole of the sugar into wine. Where a sweet wine is desired, this caution is not necessary. I shall hereafter shew how wines even of this quality can be procured from such a fluid, by an artificial suspension of the fermentation. I cannot too strongly caution the artist against the use of the common and pernicious practice of exciting the fermentation, by the yeast of beer. I have already made it appear, that when a due proportion exists between the leaven and sugar, either in a natural or artificial fluid, a regular fermentation takes place, and a perfect conversion of the whole into wine. It is therefore unnecessary to add yeast to a fluid properly compounded; and it is further injurious, since the use of this substance not only communi-

cates the bitter flavour which it derives from the hop, but a peculiar and nauseous taste, apparently derived from its ammoniacal quality. It is well known to brewers, that a single spoonful of putrid yeast, will spread its contagion through many tuns of beer. If an artificial yeast is ever wanted, it may be found in the lees of wine, in which it is mixed with tartar, or else it may be reserved from the fermentation of former parcels of domestic wines. But a proper management of the fermentation itself may be made to supply the want of natural leaven. I have already shown, that this leaven is rendered insoluble by the act of fermentation, and that it partly rises to the surface, and partly falls to the bottom of the fermenting fluid. By restoring this separated matter, the process may be protracted at pleasure, till the wine has acquired the degree of dryness that may be desired. It is only necessary for this purpose to break the *head*, and disperse it through the fermenting fluid, or to agitate the whole in such a way, as to mix the lee and scum with it, until the desired effect is produced. The apparently obscure process of rolling wine, or of returning it on the lees to *feed*, as it is technically called, is founded on this principle; it renders the wine stronger and better, by re-exciting the languid fermentation. The converse of this practice will be equally intelligible. If a sweet wine is desired, the fermenting process may be at any time artifi-

cially suspended, by separating the wine already produced from the ferment with which it is mixed. The operations in use for this end, consist in decanting, in clarifying by means of glue or albumen, or in the use of certain chemical substances which decompose the leaven; processes which I must consider more at length hereafter. From this view, it will be easily deduced, that sweet wines cannot turn sour because their leaven has been expended. Another remark of equal importance may also be deduced, that all wines will have this tendency, if the whole of the sugar of the fluid has been converted, and if at the same time care has not been taken to separate completely the leaven which may remain in them. Hence the necessity of fining wines for their preservation, as well as their beauty. It will also be apparent, that if any fluid to be fermented, is of such quality, that the leaven predominates over the sugar, it will be necessary to stop the process by chemical means, to prevent the occurrence of the acetous stage, which would otherwise take place.

I have already stated, that both the malic and the tartarous acids take a share in the process of fermentation. Where the former naturally predominates, as in apples and pears, the produce is cider or perry; where it abounds in the juice of the grape, it is supposed to lead to bad qualities in the wine. The practice of liming wine vats, and

that in use with sherry wines, seem to have been founded on some views of this nature.

It appears from the experiments of the Marquis de Bouillon, that tartar contributes to the formation of alcohol, and that it is partially decomposed during this process, a portion of it being converted into malic acid. But even sugar and tartar require the presence of vegetable extract, before they can be induced to ferment, although the addition of tartar materially increases the facility with which a compound of sugar and extract only is brought into fermentation. Hence we are enabled to explain the reason why moderately acid grapes run much more readily into fermentation than sweet ones.

From this view of the presence of tartar in the grape, and its utility, we may now deduce rules applicable to the art of domestic wine-making.

The juices of our fruits are known to be deficient in saccharine matter, and experience has long established the well known remedy,—that mixture of common sugar on which the whole art depends. But it has not generally entered into the views of makers of wine, to supply this other important defect, although the means are equally easy. The makers of *sweets* are indeed acquainted with it, although, from the defective nature of their process in general, it has not produced in their hands

the effects which might have been expected. Their principal error consists in the use of yeast and molasses,—articles whose vicious nature is incorrigible; but in the experiments which I have directed to be made on this subject, ample reason has appeared to consider the addition of tartar to the juices of our fruits, as a valuable improvement in the art of making domestic wines. In the use of this ingredient, no very accurate limit seems necessary, since the wine of the grape may generally be considered as a saturated solution of tartar; and I may add, that by using crude tartar instead of the purified salt, we derive other advantages from the leaven contained in the lees attached to it.

From the preceding remarks, we shall be at no loss in understanding the true theory of this art. The formation of a liquor truly vinous, is the first object, and the adventitious circumstances of colour and flavour will be considered hereafter. It is almost superfluous to say, that the wine of the grape is superior to every other vinous liquor, and we have, in the foregoing remarks, a detail of the circumstances on which the formation of wine from that fruit depends. These are sugar, the extractive matter, and tartar. If now we compare our common fruits with the grape, we shall find, that, in common with it, they possess the extractive matter or natural leaven, but that they are deficient both in sugar and in tartar. Our first object, therefore, should be to assimilate them as nearly as

possible to the grape, by the addition of the requisite proportions of those two substances. The whole process is, therefore, from its commencement, artificial, and capable of considerable precision. It is only required so to proportion the adventitious ingredients to the natural juice, as to form a fluid resembling the juice of the grape. To the peculiarities of the several fruits employed, we must afterwards look for the flavour or other accidental properties which they may be capable of giving. It is necessary also to consider, that as the several fruits may differ in their quantity of leaven, as well as in their proportions of sugar and acid, some attention to their various compositions will be required, before any accurate rules of practice can be established. We can also see, that we are limited in the application of our own fruits, and that we cannot avail ourselves of all the use which we might derive from their natural sugar, nor in some cases from their leaven, lest we should introduce too large a portion of their malic acid; that acid in which they are too apt to abound, and which I have already stated to be ill adapted to the formation of genuine wine. They who shall attempt to make wine from the juice of the currant or gooseberry alone, will feel practically the force of this statement. We also may see from these general principles, that we are not necessarily limited to the use of fruits; since, being indebted to the fresh

vegetable for very little more than the extractive and fermenting matter, we are permitted to seek it, even among leaves and roots.

But to return to the agents engaged in fermentation; water is one of these, and we have seen, that a certain degree of fluidity is essential to this process. If a mixed solution of sugar and leaven is concentrated to a certain degree, it refuses to undergo the act of fermentation, or enters into it with difficulty. For the same reasons, its progress is so slow, that the result is generally a sweet wine; since the operator, accustomed to regulate his processes by time, rather than by the changes which the liquor experiences, is apt to conceive it finished before it is well established, and thus to suspend it, by the operations of decanting and clarifying, before the liquor has suffered all the changes of which, in due time, it is capable.

When the juice to be fermented contains, on the contrary, too large a proportion of water, the fermentation is equally slow and difficult, but the produce is weak, and runs readily into the acetous stage. Thus, weak currant juice exposed to fermentation, is converted into vinegar, by a gradation so regular, that it can scarcely be said to form wine, during any part of its progress. In wine countries these opposite evils are remedied, either by dilution or concentration. The artificial composition of the fluid used in the domestic manu-

facture, admits of more ready remedies, already sufficiently obvious from the preceding remarks.

Having examined the nature and re-actions of the ingredients to which the process of fermentation is owing, it is now proper to attend to the external circumstances which affect and regulate it, before any rational processes can be adopted for its conduct.

Temperature is one of the external circumstances which has the greatest share in influencing the act of fermentation, and that of 54° has been considered the most favourable. Some latitude is however to be allowed; but in a temperature either very high or very low, this process does not go on at all. Attending to this circumstance, we are enabled to regulate the process when it does not proceed regularly, either by cooling the fluid to check its too rapid progress, or by warming it when it proceeds in too languid a manner. By this we can also explain a phenomenon of common occurrence in wine-making, a renewal of the fermentation which takes place in spring, after it has been partially or entirely suspended by the cold of winter. This is a subject worthy of attention, as some important practices in the art depend on it. Thus, if we are desirous of making a wine to imitate *Champagne*, it is necessary to watch for the period when the fermentation is re-excited by the arrival of spring. By bottling in this stage, we

insure a brisk wine, which, if bottled, either in the cold of winter, or after the second fermentation has been exhausted by the heats of summer, would be dead or still. This renewal of fermentation, or *fretting*, as it is sometimes called, is also a favourable time for the addition of flavouring matters, as they then give out their flavours and combine with the wine. It is at this time also, that spirits should be added to the wine, if it is ever allowable to make this addition. It is the only time at which alcohol can safely be added without destroying its vinosity, as it then enters into a kind of chemical combination with the wine.

It is necessary likewise to consider the effects which the *air* produces in fermentation, although its presence may rather be considered as favourable than essential. If the liquor is shut up in close vessels, it does not readily ferment, although it still slowly undergoes this process, and is at length converted into perfect wine. It is ascertained, that no air is absorbed during the vinous fermentation, although this happens in the acetous, but that the free and ready disengagement of the carbonic acid, is the principal circumstance in which fermentation in open vessels differs from that in close ones. One important fact, however, is established,—that the wine is stronger when the fermentation has been either partially or totally carried on in close vessels, and that the flavour is

also better preserved; and it appears that a great part of the alcohol produced is dissipated by the carbonic acid, which holds it in solution, and which produces a well known effect, both on the organ of smell, and on the nervous system in general, when this disengagement is made in the stomach. It is not yet well explained, how the carbonic acid is disposed of when produced in close vessels. Many of the practices followed in making particular wines, depend on a consideration of these two modes of conducting the fermentation; but it rarely happens that an exclusive fermentation in close vessels is used. This is generally reserved for the last and most tranquil stage. A consideration of the effects produced by these different methods, and of the product which we wish to obtain, will be necessary to guide us in our choice of either of these two processes, or of a certain admixture of both. If the wine is meant to be still, and if it is not desirable to husband the strength and flavour, the whole fermentation may be carried on openly. This will be the case with strong and sweet wines. If, on the contrary, a wine of the character of Champagne is intended, which must retain its briskness, flavour, and strength, we must be guided in our practices by rules similar to those in use in that, and other districts of France, and adopt a partially close mode of fermenting. In all cases, it appears to

be a useful practice, even if the first fermentation is carried on in an open vat, to exclude the free access of air, by covering the vessel with boards and blankets. If the first fermentation is carried on in the vessel in which the liquor is meant to continue,—a case which can only occur when no solid matter is fermented with the fluid,—a slight covering will be sufficient. Whatever process has been adopted in the first instance, the bung may after a time be lightly put down, and ultimately tightened, a spill-hole being added, to give an opportunity of relieving the vessel from time to time, of the elastic fluid which might endanger its safety.

The *volume* or quantity of the fluid, is the last circumstance which requires notice, as influencing the act of fermentation. This process is more rapid and more perfect in large, than in small vessels, and is often entirely completed in the course of a few days in a large vat, while, in smaller vessels, it may require weeks or months for its perfection. This question, interesting to manufacturers of *sweets* on a large scale, is of little moment to domestic makers of wine, among whom the quantity made at any one operation is generally small. But it is not quite uninteresting even to them, as it explains some of the difficulties with which they have to contend, and serves to direct and guide their operations. The same materials, for example, will not

experience the same changes in equal times, if they are exposed to fermentation in the quantity of two or ten gallons; and time will therefore be allowed by the operator, in a ratio the inverse of the bulk of the fluid on which he is operating. I may also remark, that if there be a flavour to preserve, it will more readily be secured when the fermentation is slow, and the mass of fluid small; and that the sweeter and thicker juices, require to be treated on a larger scale than the thinner ones. It is easy to make lemon wines in a cask of two gallons; but it is a very difficult task to operate on so small a quantity of thick and sweet raisin wine. This is one of those general principles, which, together with the quality of the liquid, the temperature, the proportion of leaven, and the other circumstances which I have inculcated, ought always to be present to the maker of wines, since it is only by conforming to the complicated actions of these various causes, that he can hope to secure certainty or uniformity of result.

I may pass lightly over the phenomena which occur during the process of fermentation, which, however important to a general view of this subject, are, from their minor share of practical interest, more easily dispensed with, than those details which are necessary to the unphilosophical practitioner.

The act of fermentation is marked by the extrication of air-bubbles, and by the agitation and

turbid appearance of the liquor. The turbid matter is shortly separated into two portions, which, in part, rise to the surface in scum, and, in part, subside in the form of lees. Both of these, as I have before shewn, have the power of continuing the act of fermentation; and it has also been shewn, that their separation, by decanting and clarifying, serves to check this process. For the same purpose, the cask is kept always filled to the bung-hole, so as to admit of the disengagement of the scum or yeast as fast as it is formed. The bulk of the liquor is increased during fermentation, partly in consequence of the heat excited, and partly from the extrication of the carbonic acid gas which is separated. It will be obvious, how the practices required in regulating the qualities of all wines, must be deduced from this general fact respecting the management of the yeast during its production, and that the manipulations must be different when either a sweet or brisk, or a still and dry wine is desired. In the former two, the fermentation will be checked, by filling to the bung-hole; in the latter, the yeast will be allowed to subside.

The *carbonic acid* is not necessarily separated and disengaged from the wine, since the brisk wines of Champagne owe their sparkling quality to a portion of it which is retained by them, either in consequence of the period of bottling being duly chosen, or to a portion of leaven allowed to

remain in the bottled wine, and which has a tendency to renew the fermentation under confinement. This quality is sought after in many wines, and it is often, in the worst class of Champagne wines, the only valuable one which they possess. It is owing to the necessity of having a superfluous quantity of leaven for producing this effect, that a brisk wine is with difficulty made, unless a portion of unripe fruit enter into the composition. This is the case with the wines of Champagne, and equally so with the produce of our gooseberry, which has been conceived to resemble them.

I have already mentioned, that the carbonic acid of fermentation is supposed to contain alcohol, and thus, by fermenting in closed vessels, a great part of the spirit of the wine which would be dissipated, is retained and preserved.

Heat is also generated during fermentation, and to such a degree, as often to require tempering; but as this can only occur in manufactories on a large scale, I need not dwell on it.

The *colouring matter* of the fruit is extracted during this process, since the darkest grapes yield but a white wine, if their skins are not fermented in the liquor; and, by attending to this fact, we can regulate the colouring of our wines at pleasure, if the fruit possesses this principle.

The last and most important effect of fermentation, is the *formation* of *alcohol* or *spirit*, and this

depends collectively on the proportion of sugar in the entire fluid, on the due proportion of the leaven to that sugar, and on the perfection of the fermentation. The whole of the sugar is seldom decomposed during the first process of fermentation; but a proportion is generally attached even to the wines considered dry, long after they are tunned or bottled. It is only by a slow continuation of the same actions in casks and bottles,—a process often requiring many years for its completion,—that the sugar entirely vanishes, and the liquor is found to consist of alcohol, combined with the other matters which join it to form wine. It is important to consider the effects produced on wine by a portion of undecomposed sugar remaining in it. As long as this exists, the acetic fermentation cannot take place, and it therefore offers a test of security against this result, in our ill made domestic wines. In the natural wines, the balance of principles appears to prevent this occurrence, even when all the sugar has disappeared; and thus Hock, Claret and Madeira seem to be possessed of the power of endless duration.

All care will be unavailing, if the process of fermentation, and its application to practice, be not thoroughly understood; and I shall therefore deduce from the general doctrines laid down above, some further rules which have been cursorily passed over. If all the favourable circumstances already described are present, the act of

fermentation goes on without any assistance, by the action of natural causes. The circumstances which are capable of impeding these natural actions, exist either in the quality of the liquor, or in the temperature to which it is exposed. When the liquor is a natural *must*, like the juice of the grape, it rarely labours under any other defect than the want of saccharine matter,—a defect which the experience of wine countries has found the means of correcting by the addition of sugar of honey, or of *must* evaporated by boiling, until it has become a thick saccharine fluid. The same defect is also sometimes remedied, by partially drying the grapes, or by adding burnt gypsum, or plaster of Paris, to the *must*, so as to absorb the superfluous water. It is evident, that as the maker of domestic wines has always an artificial fluid on which to operate, he need never be subject to any inconvenience from this cause, as it is in his power at all times so to compound his *must*, as to render it answerable to the requisite conditions. The management of the fermentation, when it has actually commenced, must also be regulated by the views of the artist, respecting the wine which he wishes to obtain. If sweet, the proportion of the water as well as that of the leaven to the sugar, must be reduced in compounding the *must*, or his *working receipt* must be modified to this end; and the management of the fermentation will then be such, as to discharge

the yeast as fast as it is generated, by keeping the cask full to the bung-hole, and by a careful repetition of decanting and clarifying. If, on the contrary, the wine is to be dry and strong, the proportion of the leaven will be increased, and the yeast will be agitated with the liquor, by rolling and stirring, so as to protract the fermentation. If the wine is to be brisk, the proportion both of leaven and water will be increased, and the fermentation will not only be conducted in vessels partially closed, but the liquor will be bottled and secured, before the fermentation is finished. The management of the temperature is easily deduced from the general doctrines. When the fermentation languishes from defect of heat, it is necessary to introduce a stove into the apartment where the process is carried on, or, by heating a portion of the liquor, and mixing it with the mass, the temperature may be elevated to the most favourable point. Injurious changes, arising from variations of the external temperature, may be warded off, by a covering of straw or blankets. These attentions, trifling as they may appear, are by no means unimportant, since they are sufficient to cause the whole difference between good and bad wine. It is owing more to varieties in management, than to radical differences in the qualities of the grape, that the wines of different countries differ so widely from each other, and

that the wines of France, for example, possess a superiority so decided over all others.

The limited nature of this little essay, prevents me from entering on the chemical theory of Fermentation, a subject still very obscure; and I shall therefore proceed to consider the management of wines after fermentation, a subject of more practical interest.

Many popular practices in the after-treatment, and in the suspension of fermentation, are founded on positive precepts respecting the time which the process has occupied. But time is but one out of the many elements which should enter into this calculation; since it has already been seen, that it is modified by the varying quality of the fluid subjected to that process, by the temperature, by the mass, and by many circumstances which it would be superfluous to repeat. Other rules, which are apparently better founded, since they are deduced from the appearances after fermentation, may yet deceive us, if they are too implicitly followed, without a due regard to the ultimate intentions of the operator, respecting the quality of his wine. Neither the smell, taste, or colour of the fluid, nor the activity or cessation of the fermentation, are positive guides. As the prime object is to convert the sugar into spirit, it is evident that the fermentation must continue longer, if the

produce is to be a dry wine, and the reverse if a sweet one. If, on the contrary, it is the wish of the operator to preserve the flavour or *bouquet* of the wine, the period must be shortened. The case will be the same if a brisk wine is wanted, as the carbonic acid on which this property depends, would be irrecoverably dissipated, by an undue protraction of the fermenting process. As all wines are reducible to the four general divisions, of dry and strong, sweet, light and flavoured, or brisk; it is plain, that a regard to this ultimate object, their quality, must determine the mode of proceeding. If it is intended, for example, to make that kind of dry wine which is made in this country from raisins and sugar, the same practices will be necessary which are followed in the countries where wines are made from the grape for distillation. In this case, the wine is suffered to remain in the vat for three, four or more days, until it ceases to have a saccharine taste, and till the whole of the sugar is converted into spirit. If it is intended to make a strong and sweet wine, the fermentation must be discouraged, by speedily removing it from the vat to the cask, and by the further use of processes hereafter to be described, which suspend and ultimately destroy the fermenting process. If it is desired to produce a light and flavoured wine, like those of Burgundy, for example, the practices should resemble those followed in that country. There, the *must*

is allowed to remain but a few hours in the vat, the time varying according to the quality of the *must*, the temperature, and other accompanying circumstances. The period is, *cæteris paribus*, always shortened, when flavour or perfume is expected from the wine; a precaution, however, which the maker of domestic wines may dispense with, as the little flavour he has to expect from the fruits of his own growth, is generally better avoided. Further, if it is proposed to make wines brisk, and resembling those of Champagne, the juice must remain in the vat but a few hours; and indeed when small quantities only are operated on, it is often prudent to conduct the whole process in the cask, even from the commencement.

I cannot conclude these general directions, without inculcating the necessity of cleanliness in the use, and care in the selection of the casks, since results otherwise promising, are often destroyed by this minor sort of negligence.

In removing the wine from the vat to the cask, it is necessary to get rid of all the insoluble and superfluous matter which it may contain. This removal, is in fact the first stage of decanting,—an operation of which the careful conduct is of prime importance in this manufacture. By tapping the vat at a due distance above the lee, and by stopping the flowing liquor before the scum has descended too low, this separation is in general

easily effected. In some cases, straining may be required; but in all, the scum should be carefully removed, as it is from exposure apt to acquire either a musty taste, or acid property, easily communicated to the liquor. In the wine countries, the solid matter is exposed to the wine press. Here it would not be an object worthy of the labour required.

The wine thus far advanced, still undergoes a fermentation in the casks, more languid, yet necessary to its completion. If this process be suffered to go on indefinitely in those wines of which the saccharine matter has been entirely decomposed, it will proceed to the acetous stage, and vinegar instead of wine will be the result; the natural tendency of fermentation being a progress from the vinous to the acetous stage, which, if not counteracted by circumstances in the wine itself, must be prevented by artificial expedients. The natural circumstances which prevent this change, consist in that state of proportion between the leaven and sugar, which allows part of this last to remain undecomposed after the process is completed, or a balance of principles so nice, as to terminate in a perfect neutralization of the two elements which conspired to produce it. This accuracy is perhaps seldom obtained, since the palate is unable to detect the last portion of sugar, marked as it is by the predominant taste of the wine, on the qualities of which it nevertheless produces an

advantageous effect. Knowing that the acetous process cannot take place while sugar remains unchanged in the fluid, we can regulate our conduct in the use of the artificial means of checking fermentation above alluded to, since any anxiety on this head is unnecessary while the wine continues sweet. We can also see from the same consideration, how the addition of sugar to a wine whose durability is suspected, may prevent the acetous process from taking place, although, when this process is once established, it would be, according to circumstances, either unavailing, or the cause of a speedier conversion into vinegar.

I must now describe the artificial means by which fermentation may be checked or stopped, in those cases where a natural termination would not occur. Those most generally used, are racking and fining, of which the object and effects must already be intelligible to those who have read the preceding remarks. Turbid wine is in an unfinished state, as well as in a precarious one, and its brightness and purity is not merely an ornament, but a property necessary to its permanence. It is from being left in this state, that wine frequently becomes *pricked*, this disease being the first stage of the acetous fermentation, but one which may also originate in other causes already explained. But although racking and fining may disengage the wine from all precipitated leaven, it

will not separate that which is held in solution, and of which the tendency is equally to destroy the wine at some distant period. For this purpose, chemical means are required, and the process in common use, is known by the name of *sulphuring*. Many unnecessary and complicated methods are resorted to for this end; the most simple is equally effectual, and consists in filling the empty cask with the vapour of sulphur, from burning matches placed in the bung-hole. The wine is then introduced into the cask, and if this first operation is found insufficient, it may be repeated as often as is necessary. When the *leaven* is so abundant, that a very large quantity of sulphureous acid is required, as in many of the wines of Bourdeaux, a portion of wine, impregnated with the gas, by a process similar to that of the silk-bleachers, is used for mixing with the wine in the cask. The sulphite of potash, offers itself as a convenient substitute for this operation; and in the quantity of a drachm or two, it is sufficient in general for a large cask of liquor. Other chemical agents, capable of accomplishing this end, might be enumerated; but the operation of the whole is similar, and consists in precipitating, and rendering insoluble the leaven which was contained in the wine. It is obvious, that this process must be followed by that of racking and fining. The substances used for fining, are most commonly isinglass, or the white of eggs, and the mode of

applying them is universally known. Sand, gypsum, starch, rice, milk, blood, and the shavings of beechwood, have been found to answer the same purpose.

In the general practice of making wine from grapes, many expedients are in use, to remedy particular defects of colour, sweetness, flavour, sharpness or dulness. As few of these are applicable to wines of domestic manufacture, I shall pass them over slightly. The causes and remedies of excessive sweetness, must already be obvious from what has been said. The causes of offensive sharpness, are either the excessive fermentation of a weak and watery *must*, or an undue portion of malic acid. In the former case, the wine is tending to vinegar, and although the evil may be palliated, it can scarcely be remedied, nor is it perhaps, in the case of our domestic wines, worth the remedy. The use of lead, chalk, and other expedients, must be left to manufacturers. The mode of prevention, is more worthy of our attention, and it is obviously that of using a better *must*, or attending more carefully to the fermentation. That sharpness which arises from excess of malic acid, is well exemplified in hard cider. It is not a fit object of remedy, but may be prevented by a better choice of materials, or by the expedients alluded to in the beginning of this paper.

A disagreeable quality opposed to the former, is flatness, or a mawkish flat taste, which, though

sensible to the acuter palates of those who are habituated to good wine, is scarcely perceived by those who are accustomed to the strong dull wines, so generally used in England. The light and quick flavour, so perceptible in the wines of France, disappears under the treatment by which the more fiery wines of Spain and Portugal, are made marketable in this country. At times, flatness may arise from age, or from the complete annihilation of the fermenting process; but the most common cause is the admixture of brandy or spirit. This addition, when used in excess, is not only injurious to the liquor, but to the constitution, as it introduces an additional quantity of ardent spirits, into a beverage already perhaps too strong. Its use is also in some measure founded on a mistaken principle, as it is resorted to, at least in this country, among the makers of domestic wines, for the imaginary purpose of checking fermentation, and preventing the occurrence of the acetous state. It has been shown by recent trials, that alcohol does not check the acetous process, unless added in a much greater quantity, than it is ever used for wines; and I have already pointed out the true principles on which the tendency to vinegar may be prevented. An idle notion is prevalent among makers of domestic wines, that they are deficient in durability. The unfounded nature of this belief, must appear from every thing which has been stated respecting the true theory of wine; and I

may here add, that the durability of these wines, is in fact shortened by the admixture of brandy, since it ultimately decomposes them, driving off their carbonic acid, destroying their brisk and sprightly taste, and rendering them vapid and flat, while at the same time, their salubrity is diminished, and their price increased.

If, notwithstanding this view, makers of wine are still determined to have recourse to the practice of adding spirit, I will now point out the least injurious manner in which it may be effected. It may be added to the liquor before fermentation,—a method in use in the manufacture of sherry. It may also be added, during the subsequent renewals of the fermentation, which have a sort of periodical recurrence in the cask; the operation being founded on the practice known to wine-coopers, by the term *fretting-in*. When for any purpose it is found convenient to mix two varieties of wine, that time of spring is selected, when a slight fermentation is renewed, or this process is brought on by rolling or heating. A perfect union of the wines mixed at this period then takes place, a slight fermentation being induced, which serves to unite the whole into one homogeneous fluid. It is under similar circumstances that brandy may be added, and it then enters into a combination with the wine, more nearly resembling that natural union in which alcohol exists in this fluid; while

at the same time it produces less injury, either to the flavour of the liquor, or to the health of the consumer.

The sketch which I have now given of the general principles of wine-making, may possibly suffice for the purpose of practice, and enable the practitioner to guide himself by rules, both more correct and more generally applicable, than the positive ones on which he has hitherto proceeded. I shall now proceed to a cursory examination of the several practices in use in our domestic manufacture. The receipt books abound with details, which it is unnecessary for me to examine, as it would be a waste of time to comment on manipulations, which have been guided by no principles, of which a great number is manifestly absurd, and of which many others appear incapable of giving results at all resembling wine. I shall content myself with noticing the most prominent errors, and with pointing out those general practices in which the most rational receipts can be made to agree.

When we read in many of those books of receipts, directions for sulphuring the casks before fermentation, we must be convinced, that such directions have arisen from an utter confusion of ideas on the subject. The same remark may be made on another rule, of which the object is equally misapprehended; the mixing of white of egg with the fluid about

to be subjected to fermentation. The proportions of sugar seem to have been allotted with equal want of consideration; and it seldom appears to have entered into the minds of the inventors, that the strength of the wine was to depend on this ingredient. The proportions of the fruits to the total compound, seem to have been dictated by similar caprices; their natural properties, whether of sugar, acid or flavour, not having been considered in the views of the artist.

Those ingredients which are added for the avowed purposes of flavour, have been managed with similar want of judgment, and they have indeed often been supposed capable of communicating the strength, or vinous quality, to the liquor. Instead of being introduced at the decline of the fermentation, they have been exposed to all its effects; in consequence of which, their flavour has often been volatilized or destroyed. This is the case with cowslip wine, where an enormous quantity of flowers is used, to obtain an effect which might be procured with a much smaller allowance. Such also is the practice with raspberries,—a practice worth noticing, since it affords an opportunity of stating the more correct and useful mode of proceeding. If an attempt is made to form wine from raspberries and sugar, a liquor will be produced with little or no flavour of the fruit; but a small quantity of syrup or juice of raspberries added at the decline of the fermentation,

or a little fresh fruit suspended in the cask at the same period, will be sufficient to communicate a taste, more likely to prove excessive than defective.

But the most striking defects of the common proceedings are visible in the vacillation and uncertainty, with which both the fermentation and the subsequent processes are conducted. By using the yeast of bear,—a practice founded on ignorance of the nature and causes of fermentation,—a false and bad flavour is introduced, which is often sufficient to render the produce tainted and even nauseous. By want of attention to the process itself, and the circumstances by which it is affected, the artist is unable to advance or retard it, to alter or amend it; while, guided solely by rules founded on fixed periods, inattentive to its subject or its concomitancy, and undecided respecting the future character of his wine, it is not surprising if he meets with perpetual disappointment, producing still wine when he wished for brisk, or sweet when he intended to form dry. The same want of principles prevents him from taking advantage of the practices of sulphuring, racking and bottling, as will be obvious to those who shall compare the practices in daily use, with the more correct ones which have been laid down.

I must now proceed to give a view of the methods in common use, as far as they offer differences worthy of notice, confining myself to those

varieties of domestic wines, which are either in themselves good, or capable, under proper management, of being rendered so. I shall take no notice of the projects to make wines from esculent roots, as I believe that they are misplaced; but limit myself to fruits, from different kinds of which, the several wines take their names. I shall also omit the grape at present, because, considering it as almost exclusively worthy of attention, I wish to treat of it in a separate paragraph.

The fruits chiefly in use are the quince, cherry, strawberry, sloe, elder-berry, damson, mulberry, black or bramble berry, raspberry, orange, lemon, gooseberry, and the three varieties of currant. Dried raisins, although not ranking among our fruits, are extensively used, and require also to be noticed.

A wantonness of experiment seems to have, in some measure, led to this great and superfluous number of articles as the nominal bases of wines, although the practices have also been in a great degree, founded on false views of the real nature and objects of this manufacture. It is evident, on the principles already laid down, that when no peculiar and agreeable flavour follows the adoption of any individual fruit, it can have no legitimate claim for use, beyond that which is founded on its several proportions of sugar, leaven, acid, colour or astringency. As the two last of these can be communicated with the greatest certainty

by adventitious ingredients, it is bad policy to have recourse to weak expedients for the same, and particularly, if, for the sake of these minor objects, we must sacrifice others of greater importance.

Since also the sugar is, confessedly, and in all cases, an adventitious ingredient, capable of being proportioned with the greatest nicety, completely in our power, and of a moderate price, it is unnecessary to consider that ingredient in fruits as the one which is to guide our choice. It is to the due admixture of acid, and of leaven (the fermenting principle), that we are chiefly to look for the causes which are to determine us in our selection. If a good flavour can be obtained from any fruit of our own growth, we have then the whole data which should rule our determinations. The object of price, is a consideration which will naturally be added to these more important ones.

The Quince appears to have usurped a place in the foregoing list, to which it properly has no title. Its similarity in principles to the apple and pear, is sufficient to assure us, that its produce can only be a species of cider, characterised, according to circumstances, by the astringency and flavour which distinguish it from these two fruits. Its price and rarity also increase the objections to its use.

Vinous liquors, of no very particular character, may be made from the several varieties of Cherry; but the operator should be cautioned against the common practice of pressing the kernels in

quantity, as, however agreeable a slight flavour of the bitter may be, a taste amounting to bitterness, is always unassimilating and injurious to the wine.

From the Strawberry, wines of agreeable quality, both dry and sweet, may be produced; but the peculiar flavour of the fruit is generally dissipated in the process. The cautions which I have given respecting flavour, will suffice to point out in what way that is most likely to be obtained.

I make the same remark on the Raspberry, with this additional hint, that as very little in point of flavour or produce is gained by the use of these fruits, which are in most places of a high price, it behoves the operator to balance the advantages against the disadvantages, before he enters on the undertaking. A simple infusion of this fruit, as before noticed, in any flavourless currant wine, will, with greater cheapness and certainty, produce the desired taste.

Having no experience in the Brambleberry or Mulberry, I am unable to say, whether any flavour can be communicated by their use. The cheapness of the former is a recommendation; and there is no doubt that they both contain the substances, leaven and acid, most essential for this purpose. They also afford what so few fruits do to the same degree, the colouring principle. In managing them, so as to derive the greatest advantages from their colour, it is necessary, that the fermentation be allowed to go on with the skins, until the co-

lour is extracted, which will also be accompanied by the slight degree of astringency, which, at a certain period of ripeness, accompanies both these fruits.

The Sloe and Damson are so associated in qualities, that nearly the same results are produced from both,—a bitterish and astringent liquor, capable of being converted into rough wine of a good character, care being taken duly to proportion the quantity of fruit to the sugar, or to modify that liquor by the addition of other fruits of less decided properties. This is a case, in which it is necessary to protract the fermentation, so as to make a dry wine, as the peculiar astringency of these fruits, forms a very discordant association with sweet wines. By a due admixture of currants or elder-berries, with sloes or damsons, and with proper care, wines not much unlike the inferior kinds of Port are often produced. Since receipts are in the hands of every one, I need not detail the proportions, which ought, in fact, to vary, both according to the ripeness of the different fruits, and the particular views of the artist.

In naming the Elder-berry, I have mentioned a fruit whose cheapness and abundance have long recommended it to notice; and from which, with attention, excellent red wine can really be made. It seems to possess in great perfection, that portion of the extractive principle, which is requir-

ed to produce a free and full fermentation; and its admirable colour, communicates to the wine a tint as rich as can be desired. It appears to be deficient in acid; and its produce is consequently much improved, by the addition of tartar as an ingredient in the artificial *must*. Its natural sugar is so small in quantity, that it requires an ample addition of this fundamental ingredient. If it has no good flavour, it is at least free of any bad one, —a virtue which does not appertain to many of the fruits of current application in wine-making.

In apportioning the two several ingredients of tartar and sugar, the following rules may be of use.

Considerable differences in the dose of tartar may be allowed without producing any corresponding changes in the result, and the proportion of this ingredient has consequently been made to vary from one to four, and even six *per cent*. The causes of this admissible laxity will appear, when it is considered that the greater part of the tartar is deposited in the lees. I may also remark, that from two to four *per cent*. will be found a sufficient dose, and that in proportion to the greater or less sweetness of the fruit, the sweetest requiring the largest quantity of tartar, and *vice versâ*. The dose of tartar ought also to vary in proportion to the added sugar, increasing as this increases. Although pure tartar, or cream of tartar, may answer the intended purpose, the crude salt

is to be preferred, because it already contains a portion of yeast conducive to the more perfect fermentation of the artificial *must*.

In proportioning the sugar, the following general rule may also be taken as a guide. Two pounds of sugar, added to a gallon of a compound, containing all the other ingredients requisite to a perfect fermentation, produce a liquor equal in strength to the lightest class of Bourdeaux white-wines. Three pounds produce one equal in strength to the wine known by the name of White Hermitage: and from four, if fermented till dry, a wine resembling in strength the stronger Sicilian wines, that of Marsala, for example, or the Cape Madeira, is produced, supposing these wines to be free of brandy. Where a fruit already contains sugar, it is obvious that the quantity of added sugar must be diminished in proportion to that which the natural juice may be estimated to contain, if we are desirous of accurate results. If in any case wine is to be left sweet, it is clear that this general rule cannot be applied, since sweetness and strength are, in the same wine, and from the same quantities of sugar, incompatible. The rules thus laid down, render any formal detail of proportions unnecessary, since they are readily deduced from the general view; and the circumstances which ought to regulate the fermentation and after-management, have already been so fully investigated in the first part of this essay, that it would be superfluous to repeat them.

But, while on the subject of the juicy fruits, I may as well notice a part of the current practice which appears ill founded, and often attended with bad consequences. This is the large proportion of water, and consequently small proportion of fruit, which is generally used, an usage apparently originating in a misplaced economy. If we attend to the common practice of making wine from grapes, that which ought to be the model for all our imitative operations, we shall see that no water is used, but that the whole fluid is composed of the juice of the fruit itself. If we now attend to the current practice, as recommended in our own domestic receipts, we shall find that the juice of the fruit rarely forms more than one-fourth of the whole liquor, and often much less, the proportion of fruit being seldom more than four pounds, including the solid matter it may contain, to eight pounds of water, and three or four pounds of sugar; and this proportion is fixed with no regard to the ripeness of the fruit, a circumstance of considerable importance. The consequences resulting from this sparing use of the fruit are highly injurious. It is plain, that the artificial *must*, thus compounded of water, sugar and juice, must contain a much less quantity of the vegetable extractive matter, and of the native acid, than that which I have formerly shewn to be absolutely essential to a perfect and

efficient fermentation. To put this case in a stronger light, let this proportion of juice be still further gradually diminished, and the *must* will soon consist of little else than sugar and water, a compound incapable of forming wine. Let it, on the contrary, be increased, and a vigorous and perfect fermentation, with a produce perfectly vinous, will be the result.

If green fruit is used, in which little or nothing exists but acid and extract, of which the former is in this case always in much greater proportion, bulk for bulk, than in ripe fruits, the acid would be too predominant were the juice of the fruit used in undue quantity. There dilution is absolutely necessary, and of this practice I shall take occasion to point out examples hereafter. But if the fruit be ripe, the acid is diminished in quantity, and cannot therefore bear to be still further diminished by excessive dilution. It will accordingly be found, as I shall again have cause to shew, that a much more perfect wine is produced by diminishing the water, or increasing the proportion of fruit.

As the *orange* and *lemon*, although not native fruits, are familiar to us, and scarcely differ in their chemical composition, I may safely consider them in one view. So little difference exists between the citric acid which is found in these fruits, and the tartarous which characterizes the grape, that it is natural to expect their produce to

be of good quality. They are, however, deficient in extractive matter or leaven, and for this reason are incapable of being converted into wine, even with the aid of sugar, unless yeast or some other leaven be added. As it is impossible to add the yeast of beer in sufficient quantity for the perfect fermentation of the fluid, without spoiling the flavour, these wines are generally imperfect and sweet. They are likewise almost always corrupted in their flavour by the infusion of the peel, giving a taste, which, however grateful abstractedly, does by no means coalesce with the taste of wine. It would tend to the improvement of these wines, if the peel were to be omitted, and if any vegetable matter could be added capable of inducing the complete fermentation, without communicating a bad flavour. I have attempted it by means of gum, and with partial success. The principles I have already pointed out, will lead experimentalists to the search of proper substitutes for the natural leaven. It is not unlikely that they would be found in wheat; either in the flour or gluten.

The *gooseberry* is one of the fruits most commonly used, and is in particular well known as an ingredient in brisk wines, which are made to resemble, in appearance at least, the wines of Champagne. For this purpose, it is used in an unripe state. It is well known in the wine countries that, independently of those causes of briskness in wines

which consist in the management formerly described, this property always results from the use of unripe fruit, and is readily produced by mixing unripe grapes with the ripe ones. The case is the same with the gooseberry. The fault of this wine, however, if it be considered as an imitation of Champagne, is a bad flavour, which is almost invariably communicated by the fruit, and that in proportion to its ripeness. To avoid this evil, so generally injurious to the brisk gooseberry wines, the fruit can scarcely be taken in a state too crude, as at this period the flavouring substance has not been developed. At the same time the expressed juice alone should be used, care being taken to exclude the skins from the fermentation, as being the part in which the flavour principally resides. With these precautions, the noxious flavour may generally be prevented. It is true, that the produce is then without flavour, or nearly so, but this is by much the most tolerable fault in domestic wines, whose leading defect is almost invariably a disagreeable taste. Various proportions of fruit and sugar are used by different persons; but the most common consist of three pounds sugar and four of fruit, to eight pounds of water. Here the proportion of fruit is too small compared to that of the sugar, and the fermentation is consequently in general so imperfect, as to leave the wine disagreeably sweet. At the same time, the proportion of sugar is such, as to render the wine stronger than

the strongest wines of Champagne. If, therefore, this wine is to be amended in composition, it is either by reducing the sugar, if we are contented with a weaker wine, or by increasing the fruit, if we are desirous of retaining the greater strength. In managing the fermentation to a constant and successful result, the rules laid down as practised for Champagne wine are strictly applicable in the present case; and with these precautions and practices carefully attended to, the produce of the gooseberry will be invariably successful. I may also add, that it is perfectly durable; as much so as Champagne wines of corresponding quality, provided equal care be taken in the bottling, the cellarage, and other management; all of them, circumstances in which our domestic fabricators are too apt to fail, thinking that when they have mixed together a portion of sugar and fruit, their labour is finished, and that the rest may be trusted to chance. They should consider, on the contrary, that it has but then commenced.

From the gooseberry in a ripe state, wines may also be made, for which no rules are required, as they are precisely conformable to those before laid down. But the produce of the ripe fruit is commonly ill flavoured, and, whether sweet or dry, is scarcely to be rendered palatable, unless, perhaps, by a most careful exclusion of the husks.

The three varieties of the *currant*, are perhaps even better known, and more in use as ingredients

in wine-making than the gooseberry; and as the produce of each is attended with some difference, I shall notice them separately. Both from the *white* and *red* sort, wines are made, which differ principally in colour, but also vary slightly in flavour, though the flavour of neither is very characteristic. I have ascertained by repeated trials, that a principal defect in these wines, as commonly fabricated, arises from the sparing proportion in which the fruit is used, which otherwise contains a sufficient quantity of natural acid, as well as extractive matter, to ensure a perfect fermentation, if properly managed. Partly from this cause, as well as from the imperfect management of the fermentation, these wines are usually made sweet. They are also, not uncommonly, nauseous, as well from the combination of a natural bad flavour with this mawkish sweetness, as from the other improprieties of management before noticed. By increasing the quantity of fruit, (which is generally proportioned like that for gooseberry wine,) and by avoiding the use of the husks, the flavour is materially improved, and the quality of the wine further ameliorated, the fabricator at the same time acquiring the power of making his wine sweet or dry; whereas, according to the present mode, he is generally unable to produce the latter variety. The natural tendency of this fruit is to form a wine analogous to the lighter white wines of the grape, and it is a rational object to

follow the tendency which is pointed out by the nature of the fruit. I have also reason to think that much advantage would result from the use of tartar in this case, by which, among other defects, the ammoniacal taste so common in this wine seems to be prevented. The proportion of tartar need not be specified, as it has been mentioned before, and that of sugar is to be regulated by the principles already laid down. With careful management, wines are thus produced from currants not easily to be distinguished from the Colares of Portugal, which, although not in the first class of wines, is certainly superior to most of our domestic manufactures. A considerable improvement may be made in the fabric of all those wines produced from fruits of which the flavour is either bad, or which possess no flavour at all; and this is by boiling the fruit previously to fermentation, —a practice which I have caused to be adopted in currant wines with decided success. From this treatment, many tasteless fruits acquire a flavour, as is well known, and many bad flavours are converted into agreeable ones. In no case, perhaps, is this more remarkable, than in the *black currant*, which, harsh and comparatively insipid in its natural state, acquires by boiling a powerful, and to most persons a highly agreeable flavour.

In making wine from this variety of currant, the effects of this process are very remarkable; the

produce of the raw fruit being scarcely distinguished by any particular property from the herd of domestic wines, while that of the boiled fruit may with careful management be brought to resemble some of the best of the sweet Cape wines. In the white and red currant, the same precaution has been attended with results equally successful, though not marked by a contrast so decided. The same varieties of proportion are admissible in this case, as in the others lately mentioned; and I need not therefore detail receipts which are to be found in the hands of every one. To what extent the practice of boiling may be tried with advantage, I do not know; but I may venture to point it out as an improvement worthy of further investigation.

Although the dried *raisin* cannot be considered as a domestic fruit, yet as, like the orange and lemon, it is largely used in the manufacture of domestic wines, I may here take notice of it. The history of the art of wine-making, in the countries where the vine is an object of common cultivation, has already shewn, that the grape is in many places used for this purpose in a state, if not actually that of raisins, yet approaching towards it. Thus, the wines of Cyprus and Tokay, among many others, are produced from grapes which have undergone a partial desiccation. Analogy, therefore, would lead us to expect, that wines of good quality, might, in this country, also be pro-

duced, by using the dried grapes for that purpose, as they are imported in the state of raisins. Yet the success which has followed the innumerable attempts to make raisin wine, has by no means justified that expectation, although the expensive scale on which the manufacture has been, and is still carried on by the makers of *sweets*, should long ere this have brought it to perfection. It is not apparent to what causes this failure is owing, nor is it possible, without repeated and expensive experiments, to investigate the process in such a way, as to lay the foundation of a more successful practice. But an examination of the processes in common use, may perhaps suggest some hints conducive to a more rational and improved mode of proceeding.

In manufacturing this wine on the large scale, whether for the purpose of open sale as *sweets*, or for the fraudulent imitation and adulteration of foreign wines, a quantity of raisins varying from two as far as seven pounds to the gallon of water is used, together with a proportion of common clayed sugar or molasses, reaching from half a pound to three or four pounds. In many cases from four to six pounds of crude tartar per cwt. is added. Yeast is not in general employed to assist the fermentation, nor should it ever be used, for the reasons already assigned. It is asserted, that the product of this process is a pure and flavourless vinous fluid, capable of receiving any

flavour which may be required, and thus of imitating many wines of foreign growth. Whatever the case may be when such fluids are used for the fraudulent purposes above mentioned, the wines themselves, which are common in the market, and which are confessedly made in this way, are almost always nauseous, whether sweet or dry; and however they may be called by the various names of Lunel, Teneriffe, Sherry, or Canary, they have all the same disagreeable and overpowering flavour. It is probable, that a great part of this peculiarity is owing to the quality of the sugar employed; but it is also to be suspected, that the complete drying of the grape developes in that fruit, some obnoxious taste which is communicated to the produce. I cannot pretend to throw any more particular light on the subject; but should recommend to those who are inclined to make trial of raisins, a nice attention to all the circumstances in the mode of fermentation and management, which have already been detailed. If these fail to produce the desired effect of purity in the wine, we shall then be entitled to consider the manufacture of raisin wine as incapable of further improvement.

I have thus given such a brief general view of the several varieties of wines which may be made in this country, as will be sufficient to render more intelligible, the principles and practices on

which they are founded, without which, all attempts must either be futile, or must at least be regulated by chance, giving results, which will seldom obey the previous intentions of the manufacturer. The reader, who shall be at the pains of comparing what has now been said on our domestic fruits, with the more detailed theoretical and practical views laid down in the first part of this essay, will easily form for himself a correct set of rules of practice. It is in vain to say, that correct rules can be laid down in an abstract form, and capable of easy application, or that the practice may be rendered perfect, independently of the theory. Circumstances of a most evanescent nature, and, although important, often unheeded, necessarily interfere with all positive rules, and new cases are continually occurring, for which no previous rules can be given. He who is acquainted with the theory of the art, is always in possession of that light which will alone guide him through the intricacy of new cases, and of unexpected results. With the small apparatus of a theory, he has it in his power to do that without difficulty, and without labour, which he, who is destitute of theory, can seldom execute, even with the cumbrous and generally unintelligible apparatus of a set of fixed canons.

In making wines, as it is to be supposed that the fabricator has previously adopted some general views regarding the species of wine he proposes

to make, and does not intend to trust the result to chance, he should consider of what kind he wishes his wine to be, or which of the several modifications of foreign wines he means it to resemble. By these considerations, he must be guided in his practice; and to assist his views, I will briefly enumerate the several varieties which it is in his power to imitate, in their general and fundamental qualities.

The first and simple class, are the *sweet wines*, of which the fermentation is incomplete. This incompleteness may arise from two sources, either the disproportion of sugar in the *must*, or the artificial means adopted for suspending the fermentation, and which have been already described. It is to this class that our native wines bear the greatest resemblance; a resemblance indeed so general, that few makers of this article appear to possess sufficient knowledge of the art, to enable themselves to steer clear of that which may be fairly called the radical defect of domestic wines. But a consideration of the causes of sweetness in wines, already amply laid down, and of the modes in which it may be avoided, will, I trust, enable the manufacturer to choose, whether his wine shall be sweet or not,—a choice which, in the present mode of management, is rarely left to him.

The next leading description of wines, is that to which, either in a state of sweetness, or comparative dryness, is super-added the effervescence

on uncorking, which produces *briskness* or *sparkling*. The causes of this phenomenon, and the mode of ensuring, preserving and regulating it, have been also fully detailed; and it has been seen how it is compatible, either with a very considerable sweetness, or with a limited degree of the same property. As this modification is also esteemed among the made wines, it is desirable that an accurate knowledge of the method of producing it should be attained, since it is frequently missed, in consequence of negligence or ignorance in the conduct of the process. It is from gooseberries almost solely, that this variety has in this country been made; but it is by no means limited to that fruit, since, with due attention to the period of maturity, and with careful management, it may be equally well made from any other fruit. I must not, however, quit this subject, without cautioning the operator against a bad expedient, to which recourse has been had for producing the effect of sparkling. It is the introduction of a small portion of carbonate of potash or soda, into the bottle immediately before corking it. The consequence of this is, doubtless, a disengagement of gas at the moment of pouring out. But the gas speedily flies off, almost before the wine can be drunk, since it exists but in a loose state of combination, and in but small quantity. Nor does it communicate to the palate, that agreeable and lively sensation, which follows from the disengage-

ment of that carbonic gas, which is in a real state of combination with the wine. Moreover, the neutral salt formed by the alkali, with the natural acid of the wine, is always sensible to the taste; while at the same time the native acid of the wine, so essential to the composition of this fluid, is destroyed; not to mention the danger of this acid taste being replaced by an alkaline one, from an over-dose of that ingredient.

The third variety of wine, is that, of which Hock, Grave and Rhenish, may be taken as examples. In these, the saccharine principle is entirely overcome by a complete fermentation, while their after-change is prevented by a careful application of those processes laid down for the preservation of the wines of this class. Makers of domestic wines have rarely succeeded in imitating these wines. The reasons are obviously two-fold,—the great disproportion of the sugar to the subsequent fermentation in the first instance, and that want of the after-management, the neglect of which soon consigns these wines to the vinegar cask, if chance should even at first have produced success. I may venture to point out the imitation of these wines, from my own experience, not only as readily attainable, but as among the very best of those which can be made from domestic fruits. It is evident from what has been already said, that the relative proportions of the fruit and sugar in most common use, must be materially altered, and that

the fermentation must be conducted in a much more perfect manner, before we can hope to produce wines of this character. It is equally evident, that the processes of racking, sulphuring and fining, must be practised with great assiduity, to preserve these wines after we have succeeded in making them.

The last class of wines, are those which are both dry in their quality, and strong in their nature. Such are Madeira, Sherry, and the stronger wines. The theory of these is equally apparent; and it is certain, that with due attention to the fermentation, wines of this strength and quality may be made without the addition of brandy. Yet the operator has it in his power by means of this ingredient, under the restrictions already laid down, to produce wines of any required degree of strength; and I trust, that with the light which I have thus endeavoured to derive from the legitimate processes of wine-making, I have established a beacon to guide him through the trackless route of his hitherto conjectural art.

British Grape Wine.

I have chosen to throw into a separate section of this essay, the remarks which I had to offer on the art of making wine from *Grapes* of British growth, on account of the greater importance of this part of the subject, and also on account of the neglect which seems to have attended that branch of domestic wine-making. I hope to make it appear that wines, not to be distinguished from those of foreign growth, can, in this country, be made from Grapes, and at a moderate expence; and that the success of this process is not at all affected by the uncertainty which attends the ripening of the grape in our climate. It is not too strong an expression to say, that the use of this fruit is calculated to supersede that of all others, and that it is, in fact, almost the only species of domestic wine which is worthy of serious attention.

The essays of Mr Pegge in the Archæologia, with the subsequent controversies which originated in the opposition of Mr Daines Barrington, have established beyond doubt the fact, that vine-

yards were cultivated in the monasteries of Britain, for the purpose of making wine. It appears, however, by the records of Ely, that the grapes did not ripen every year, but that the vineyards, as might be expected in this climate, were subject to occasional failures. We have therefore no reason to conclude, from the establishment of this fact, that our climate has undergone any material and steady alteration,—a supposition which is often hazarded by discontented horticulturists without sufficient grounds, and apparently from no other cause, than that ill humour which delights, as it has at all times delighted, in praising the past at the expence of the present.

The physical history of Europe, indeed, shows, that its climate has, for many centuries, been in a state of amelioration. Whether this amelioration may not now have attained its *maximum* is another consideration. If it has so done, it is certainly within a period comparatively very recent. As far as we are capable of judging, no material variation in the success of our horticultural speculations has occurred for the worse, provided we choose periods of sufficient length to admit of an average result. Occasional seasons of peculiar severity, or unusual irregularity, can afford no ground for judgment. The suppression of the monasteries, the great and splendid changes which our whole system of agriculture has undergone

since those days, the increase of trade, the more economical division and application of capital to objects of commerce, and to those of domestic manufacture, the multiplied demands which wealth and prosperity have made on the consumption of wine, and the increased discrimination and taste which this has produced, have combined together to change materially both the objects of commerce and cultivation, and have jointly operated in producing the decay of this art, if (as is by no means proved) it was ever actually practised to any great extent. But this question does not concern our present purpose. It is sufficient to prove, what in fact there is no reason whatever to doubt, that the grape, as it is or may be cultivated in England, is capable of making wine; whether with advantage, considered in an agricultural view, and with what advantage, must depend on other considerations into which I need not now enter. However diminished this practice is in modern times, it is by no means extinct. The cottagers in Sussex are in the habit of making wine almost annually from the produce of vines trained on the walls of their houses. Many individuals through various parts of the southern counties, and even as far north as Derbyshire, practise the same with success. But the experiment is well known to have been made for many years on a large scale, and with complete results, at Pain's Hill, by the Honourable Charles Hamil-

ton, in a situation, with respect to soil and exposure, of which parallel instances are to be found almost every where throughout the country, and produced from land of no value whatever for the ordinary purposes of agriculture.

It is true, that the uncertainty of this climate will sometimes prevent the grapes from ripening: But this case is not without remedy.

Of the numerous varieties of grapes, it is well known to gardeners, that some are much more forward than others, and ripen their fruit at least a month earlier. It is obviously necessary to select for our purposes those which are the most early, if it is our desire to produce in every season a ripe crop. Of these, the Auvernat, the Miller, the white Muscadine, the White and Black Chasselas, the Black Sweet-water, and the Black Hamburgh, are among those which ripen earliest, and with the greatest certainty. But I need not enter on this part of the subject, since it is fully known to gardeners.

It is more important to consider, what improvements may yet be made in the naturalization of this foreign plant, and whether care and attention may not, in time, produce new varieties, still more hardy, and capable of ripening with the same certainty as the currant or gooseberry. In a paper read before the Caledonian Horticultural Society, I slightly alluded to this subject, and pointed out

the methods to be followed in naturalizing exotic plants in general *. The observations of all gardeners have long since shown, that a tender exotic, rarely, if ever, becomes habituated to a climate, if it be propagated by layers, grafts, or cuttings; since the new plant is always perfectly identical in all its habits and properties with the parent, of which indeed it forms a part. But a material change in the constitution of plants is produced by sowing the seeds, and the seedlings are invariably more hardy than the plant from which they were derived. I quoted in that paper some observations made by Sir Joseph Banks, on the naturalization of *Zizania aquatica*, and related an instance still more remarkable of a similar effect produced on *Canna indica*, a native of the West India islands, by successive sowing of the seeds in Guernsey. From these two remarkable facts, and perfect examples of success, as well as from innumerable more imperfect trials, it seems clearly established, that any plant may be naturalized to this climate, provided its seeds can be made to grow in succession. This, however theoretically true, is obviously attended with much practical trouble, in consequence of the difficulty of descending equally, and for a given length of time, through a given range of temperature; a difficulty which would, in fact, in most cases, be insuperable. But no such obstacle prevents the further naturali-

* Published in vol. i. p. 284. of the Memoirs of the Society.

zation of those which produce seeds already in our summer temperature, and which are not destroyed by our winter frosts. Among these, the vine may be enumerated. To a certain extent it may indeed be considered as already naturalized, since it flowers every summer, and the winter frosts do not destroy it. So may the common laurel be looked upon as naturalized; yet a severe winter will kill this shrub, as a cold summer will prevent the vine from bringing its fruit to maturity. It is by a sedulous culture of seedling vines alone, that we can hope to overcome this obstacle, and to produce varieties which shall ripen in all summers. For this pupose it is not sufficient to make trial of one or two successions of seedlings. Experience has shown, that numerous generations in a direct descent from the parent are required for the production of this effect. What that number is, has scarcely yet been ascertained, except in the cases of the Zizania and the Canna above quoted; but it probably varies according to the previous tenderness of the parent. In the vine, already considerably hardy, the object would probably be attained in a few generations. As I consider this object as one of prime importance, I venture to point it out to the serious attention of horticulturists, and as one which is likely to reward their labours. The production of new varieties will naturally follow these attempts, and by combining with them, the process of impregnating the flowers

with the *pollen* of different grapes, new and valuable ones may ultimately be produced. By the choice, therefore, originally, of proper varieties of the vine, and by such naturalization on these principles as we may be capable of producing, we shall have gained one great step in the art of making wine from grapes of British growth.

The next step is the choice of that soil, exposure, and method of treatment, which is adapted, not only to the habits of the vine, but to that particular climate in which the cultivation is attempted. Our guide here must be the practice of those countries, whose climate most resembles our own; of certain parts of Germany and Hungary. An elevated situation, a southern exposure, shelter to the north and north-west, rocky and southern precipices, are peculiarly adapted to the situation of a vineyard: so are gravelly and rocky soils; a circumstance in another view advantageous, since these soils are of very little value for common agricultural purposes. But I forbear to enter into details, which are to be found in many essays on gardening, and in others which have been written expressly on this subject.

It is the more direct object of this essay to show, that the making of good wine from grapes of British growth, does by no means depend on their maturation, and that this is not a necessary circumstance. The process of making wine from grapes will be reduced to a much narrower question, if

we can succeed in making it at all times, unchecked by seasons or accidents. A vineyard may thus be conducted with almost as little care as a gooseberry garden, with the certainty of a constant produce applicable to the purposes in view; and it will be in every one's power, in almost any situation. However precarious the ripening of the grape may be, its produce is not so. We are sure of an annual crop of grapes, but not of an annual crop of ripe ones.

It has been fully proved, by the facts and principles laid down in the first part of this essay, that a compound and artificial *must* can be fabricated from due mixtures of sugar, with the extractive matter and saline substances of fruits, capable of undergoing a regular fermentation, and of forming good and perfect wine. The case is as applicable to the grape as to the gooseberry. Long ago, experiments were made in France, by several chemists, with green grapes and sugar, and with complete success. I have repeated these experiments, and varied them with the best effects. The produce has varied with the management, and the results of the trials have been wines resembling Champagne, Grave, Rhenish, and Moselle, and of qualities so perfect, that the best judges and wine-tasters have not been able to distinguish them from foreign wines. The grapes may be used in any state, however immature. When even but half grown, and perfectly hard, they succeed

completely. It is evident, that wines made on this principle, will be more expensive than when made from ripe grapes, as a sufficient quantity of sugar must be used, to compensate for the deficiency of the natural sugar of the grape. But, even then, they are no more costly than currant or gooseberry wines, while, at the same time, their superiority is beyond all comparison. The hardest grapes will produce a wine of the strength of white Hermitage, with a proportion of three pounds of sugar to the gallon; and the expence will be trifling compared to the value of the produce.

It might be supposed that these wines would necessarily be devoid of flavour. But this is by no means the case, since all the specimens which were made under my direction, were characterized by flavours, as genuine and decided, as those of the foreign wines to which they approximated. I have little doubt, that, under due management, on a large scale, and with sufficient age, wines of the Hock quality, could equally well be produced here in the same way.

Many trials must yet be made before we can hope to appretiate the extent of our resources in this manufacture. It is more than probable, that different grapes, even in this immature state, would produce different wines; but these trials must be left to the efforts of individuals, and to the necessarily slow progress of experiment.

With regard to the management, it must be founded on the operations followed in the wine countries, and of which a sufficiently full account for all the purposes of practice has already been given. It is in the first place obvious, that the grapes should be suffered, (from motives of economy,) to remain on the vines, while there is any hope of gaining an accession either of strength or sweetness. They should then be carefully separated from the stems; those which are mouldy or rotten, being at the same time rejected. Some judgment will be required in proportioning the fruit to the water in the first instance, and to the sugar in the second. I have before said, that the grape, when ripe, consists of sugar, combined with vegetable extractive matter, or the fermenting principle, and certain salts, besides the astringent and flavouring matter. As the colour is not developed in the immature grape, it need not be noticed here. But the proportions of these ingredients vary materially, according to the state of maturity of the fruit. As a great part of the saline and other constituents of the grape, appear to be converted into sugar, during the process of maturation, it is plain, that, weight for weight, there will be more of the principles contained in the immature, than in the mature fruit. To form, therefore, a *must* of such a quality as shall resemble the natural *must* of ripe fruit, it is necessary that water should be added to the immature juice,

for the purpose of diluting, and thus diminishing the proportions of those saline matters, which would otherwise confer on the wine a degree of harshness, difficult to overcome.

As it is impossible to give positive rules to meet the infinitely varying and undefinable degree of maturity, in which the grape must often be used, and as such rules would in fact but tend to mislead, I shall content myself with laying down some general principles, as I have done on former occasions, leaving the application to the ingenuity and observation of the operator.

If the object be to produce a wine which shall resemble Champagne, or the white wines of Bourdeux, a small proportion of crude grape, will be required. Grapes barely half grown, require, for the production of wines of this class, to be used in the proportion of equality to water. If they are more grown, the proportion may be increased; if less, it may be diminished. If the intention be to make a wine resembling Hock, the proportion of grapes must be materially increased, and the wine at first harsh, austere, and not drinkable when new, will, by a few years residence in the cask, undergo that amelioration which time alone can give. To the proportions which I have described, varying quantities of sugar may be applied. A proportion of two pounds in the gallon of mixture, will yield a very light wine, of no great durability, resembling (under the proper treatment) the

inferior classes of Champagne wines, and under a different mode, a wine resembling Barsac, and the lighter of the Bourdeaux wines. An increase of the sugar to three pounds, will yield a wine equal in strength to the best sorts of Champagne, or, if fermented to dryness, to the strongest of the white wines of Bourdeaux. Larger doses of sugar, will doubtless yield wines of different qualities; but of such proportions I cannot speak from experience. I may only caution the operator who shall undertake these trials, that larger quantities of sugar require larger proportions of fruit, if it be his intention to work the wine to dryness, as the quantity of fruit above mentioned, is but barely sufficient to convert the proportion of three pounds above named. With regard to the durability of these wines, I may add, that I have kept them for seven years, and during all that time with evident improvement. I should consider them to be as little liable to destruction, as foreign wines of the very best *fabrique*.

While, on the subject of sugar, I may also say, that the general cause of failure in those wines which are made in this country from ripe grapes, is the deficiency of sugar, and that even these would be much improved by an addition of it. It is owing to this deficiency that these wines are perishable, and easily converted into vinegar, the natural *must* being too aqueous to produce a durable wine. The proportion of sugar need not

be larger in these cases; but, as before remarked, no positive rules can be given for it, since it must vary with the maturity and saccharine quality of the fruit,—circumstances which differ in almost every season.

Two modes of management may be adopted with regard to the fruit, either subjecting the skins to the fermentation, or not. In the first case, a greater degree of austerity will be the consequence; and the wine will consequently vary in its qualities. If the object be to make a wine resembling Champagne, the skins may be separated previously to the fermentation. If this manufacture be conducted on a large scale, the result of the second pressing may be reserved to make a distinct wine. If, on a small one, it may either be mixed with the first, or rejected altogether.

The methods of conducting the fermentation, as well as all the after-management, need not be repeated here, as they are to be found in the beginning of this essay. From these, the operator will be directed to the several sorts of wine he may wish to make. It is equally unnecessary to repeat, that wines produced in this way, may be modified either in flavour or colour, by the several expedients already detailed. But let me again inculcate, that the wine is not made when the ingredients have been introduced into the vessel. It is then that the labour begins, and nothing but

care and attention to every part and every minute circumstance of the subsequent processes, can ensure satisfaction, and produce valuable results.

To such uses may the immature fruit of the vine be converted; but the capacities of that plant are not even yet exhausted. Situations may be found in this country where the vine may not produce even immature fruit; yet still it can be directed to the end of wine-making. Chemical examination has proved, that the *young shoots*, the *tendrils*, and the *leaves* of the vine, possess properties, and contain substances, exactly similar to the crude fruit. It was no unnatural conclusion, that they might equally be used for the purposes of making wine. Experiments were accordingly instituted in France with this view, and they have been repeated here with success. From vine-leaves, water, and sugar, wines have thus been produced in no respect differing from the produce of the immature fruit, and consequently resembling wines of foreign growth. The few experiments which I have tried have been eminently successful. No further rules can be given respecting the management of the leaves, in addition to those I have laid down for the treatment of the unripe fruit. Similar proportions and similar management will, in both cases, produce similar effects. The leaves, however, scarcely yielding any thing to the press, require to be in-

fused in the water for some days before they are subjected to fermentation, and they seem to yield their soluble parts most readily to boiling water, without any material alteration in the result. The leaves of the Claret vine thus treated, produce wine of a delicate red colour. Tartar appears also to be a useful addition in this case; and it may be added in the proportion of half a pound, or even one pound, to ten gallons of the *must*. One advantage results from the use of the leaves. This is the facility with which they are reproduced during the growth of the vine; and thus, the produce of a small vineyard in leaves alone will be abundant; and that even of a single vine will be as great as is required for the use of most families, should they make this wine for their sole consumption. Let it always be remembered, that in all these cases, the price of the sugar is the price of the wine. The expence of utensils and labour is comparatively trifling, and, when the manufacture is upon a small scale, scarcely worthy of regard.

I have thus brought to a conclusion the remarks which I purposed to make on the art of fabricating wines in Britain. That I have offered so little from my own experience, will be pardoned

by those who consider that each experiment must extend to a period of one or two years, and that the labour of a life would be insufficient to reduce every one of these suggestions to practice. It will be enough, that they are all readily deducible from the labours of others, or from fair analogies taken from established rules of practice in the wine countries. The co-operation of many, to which I may hope that this essay will afford additional facilities, will in time improve this practice to that degree of perfection of which it is capable, and establish it on a sure and solid basis.

WOOLWICH,
May 1815.

NOTE.

THE Council of the Caledonian Horticultural Society strongly recommend the foregoing essay to the attention of all who wish to promote improvement in the manufacture of domestic wines. They suspect, that to many, who are in the habit of making such wines, the general *principles* on which the process depends are nearly unknown, and that others, though in some measure acquainted with these principles, still trust too much to chance.

As the Society will continue to give every encouragement in their power to the improvement of the manufacture of domestic wines, they have earnestly to request every one who may be engaged in it, to keep a memorandum of the whole process which was followed, even the

most minute manipulations. It is intended, when a very superior wine is produced in competition, to bestow a distinguished honorary reward, provided it shall appear that the maker has fully understood, and carefully acted upon, the scientific principles, the only certain guides to success.

The Council may remark, that some individuals in this place have already made considerable progress in naturalising the vine from the seeds of plants kept in the open air; and, as there is no difficulty in sowing seeds, (which will vegetate though the grape be unripe,) and in watching when the plants thus produced yield a few grapes in the open air, the seeds of which are again to be sown, proceeding in this way to several generations; hopes may be entertained of some varieties of the grape being obtained, which will never fail to give abundant crops of tolerably ripe fruit; and *that* in no long time, since, under proper management, the vine may be expected to show fruit in three or four years. In the mean time, the *leaves* (as suggested by Dr MacCulloch) may be tried; but it ought to be observed, that some shoots, from which fruit may be expected, should not be stript of a single leaf. Indeed, for the purpose of making wine from the leaves, it would be better to plant vines of any sort, and to preserve the seedlings with the greatest care. To give a pleasant colour to wines, the Claret grape may be cultivated for its leaves.—Premiums will be given for Scottish grape wine, and a Gold Medal for the first good Scottish grape raised from seeds produced in the open air in Scotland.

XVI.

Description of a Melon-Pit, employed at Alderstone, East Lothian.

In Letters from Mr WILLIAM SANDERSON, Gardener there, to ALEXANDER KEITH, Esq. of Ravelstone.

(Read 13th December 1814.)

SIR,

WHEN you were at Alderstone some time ago, you were pleased to take notice of a melon-pit which I had recently constructed for Mr Steuart; and you then did me the honour to desire, that I would send you a drawing of it, with such remarks as my own experience might afford. In compliance with your desire, I now beg leave to enclose to you a plan, which, though perhaps less perfect than I could have wished, I trust will convey my meaning.

Of its exterior appearance in a garden, I think I may venture to say, that it is rather ornamental than otherwise, and it may be approached in the

wettest weather, without inconvenience or offence to the sight. I am satisfied, and Mr Steuart allows me to say that he also is satisfied, that much less dung is necessary in forming his present melon-pit, than was made use of in making one upon the old plan; and to this advantage, may be added the very considerable one of being able to keep up the necessary degree of heat much longer than was formerly done; and that, by the simple operation of adding the dung on either side some days after the bed is made up, which communicates, and continues the heat for some time. It is also to be done afterwards, by lifting the covers represented in the drawing, and by turning over or adding more dung to what is already there, which renews the heat again.

Another advantage in this melon-pit, is its durability; those frames made of wood, are not only expensive in the first instance, but they require to be renewed every fifth or sixth year, while this of brick, may be expected to last for at least twenty years.

Of the number of melons raised by me this year, I cannot give an accurate account; but I may venture to say I had a very good crop, both with respect to quantity and quality; and it is my intention next season, to keep an account of the number and weight of melons produced in this pit, which I am convinced will be found to exceed what is raised in the ordinary way.

I have had the satisfaction to find, that my plan has been generally approved of, both by gentlemen who have taken the trouble to examine it, and likewise by practical gardeners. Many of the former, are proposing to adopt this plan in their own gardens. I am, &c.

ALDERSTONE,
25th October 1813.

SIR,

WITH reference to the letter which I addressed to you upon the 26th October 1813, I have now the pleasure to fulfil my promise then made, by stating, that the number of melons raised by me, and brought to perfection, have amounted, this season, to 167, weighing 248 lbs. I have also sent to the Secretary of the Horticultural Society, a drawing of the melon-pit, which, being drawn correctly to a scale, may be constructed by any common mason or carpenter.

I am likewise able to state with confidence, that this melon-pit does not require much more than half the dung used in the common melon-bed.

I have to apologise for the liberty I have taken in thus troubling you; but being the first gentleman who took any particular notice of my melon-pit, I have presumed to hope you would not be offended with my further observations respecting it. I am, &c.

ALDERSTONE,
26th November 1814.

MR SANDERSON's plan having been remitted to a Committee of the Society, the following report was received from one of the Members who had inspected the melon-pit at Alderstone:

"According to instruction from the Council of the Caledonian Horticultural Society, I went to Alderstone, and examined a hotbed-frame, erected for Robert Steuart, Esq., by his present gardener, Mr John Sanderson; and from every appearance, I consider it superior to the common hotbed-frames generally used, for the following reasons:

"1*st*, From the construction of the frame, the heat is maintained with a less quantity of horse-dung than is commonly used for ordinary hot-beds, and for late crops, with leaves and short

grass, without the aid of any dung. The body and linings of the bed being in a manner excluded from the action of the external air, the vicissitudes of the weather have less effect on it than in the common method, which is found to be very perplexing and laborious to the person that has the charge of them in the spring and early part of summer in this variable climate.

"*2dly*, The neat and cleanly appearance of the frame; the boards that cover the space allotted for the linings, excluding that appearance of litter and dung which is so offensive in ordinary hotbeds.

"*3dly*, The expence of wood is saved, which in ordinary frames is very considerable, as, although frequently painted, they give way in a few years.

"Upon the whole, this hotbed-frame may be of considerable utility; and I have no hesitation in saying, I would adopt the plan, at least for three-fourth of the framing at any place.

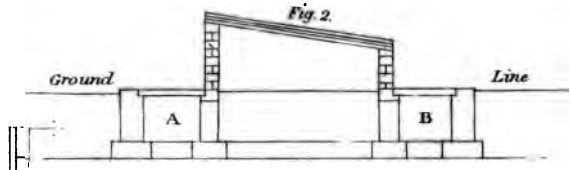
JAMES SMITH."

ORMISTON-HALL,
6th March 1815.

Afterwards, (9th May 1815,) the Council awarded the Silver Medal to Mr SANDERSON, and appointed the plan and description to be published in their Memoirs.

It may be remarked, that there is nothing new in constructing hotbed-frames with brick, and with cast-iron rafters for the glasses to slide on. The hot-bed of Mr Sanderson, is made up as usual with dung; and his improvement consists in *covering up the space allotted for the linings*, by which great advantage is gained in the saving of dung, and of heat; and in keeping the ground perfectly free from litter. This is effected, by raising the brick-work of the frame on pillars, leaving the spaces between (6 feet) open; and by building an outer wall $2\frac{1}{2}$ feet from the pillars, allotting the space between for lining the dung-bed. This space is covered by means of boards, which are removed, only when it is necessary to stir the dung, or to add fresh litter. The method of building the frame-wall, is seen in fig. 1., the pit being sunk below the surface from A to B; the solid brick-work above being 3 feet high at the back, and 2 feet in front, as seen in the section, fig. 2., where A and B shew the spaces for containing the linings. Fig. 3. is an end view; and fig. 4. a bird's eye view of the upper part of the whole. The brick-work should be supported between the pillars by bars of iron, by which means, a greater

Fig. 2.



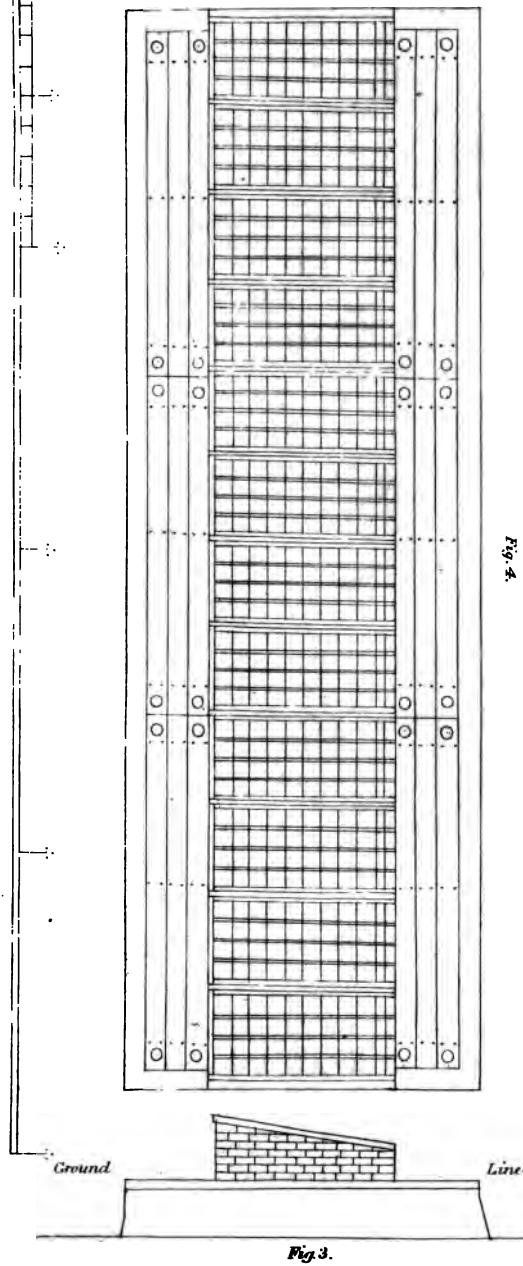


Fig. 4.

Fig. 3.

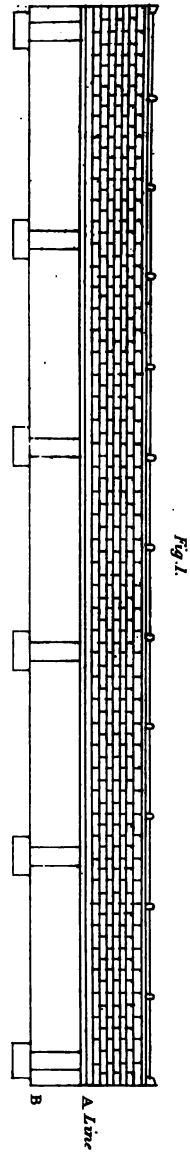


Fig. 1.

R. Mitchell fecit.

surface of the dung-bed will be exposed to the heat of the linings, than if the spaces were arched.

It is worth while noticing, that when Mr Smith saw the pit, he found, that Mr Sanderson had used for his melon-mould, two-thirds of strong tilly subsoil, dug from ditches three feet and a-half deep, without any mixture of the surface-soil; to which is added, one-third of rotten dung. This mixture he turned over frequently before using it.

XVII.

Observations on the Cultivation of Fruit-Trees.

By Mr James Smith, Gardener, Ormiston-Hall.

In a Letter to Sir G. S. Mackenzie, Bart.

(Read 5th September 1815.*)*

Sir,

To the discerning eye, the old trite proverb still holds good, "That all the trees in the wood do not grow alike." This is clearly evinced, by viewing a bed of seedling trees, wherein the vigorous vegetating power of some of the plants is more observable than others. In the nursery lines, the same power is obvious; and ultimately, in the forest, such plants, when favoured by soil and situation, become the monarchs of the sylvan shades.

But this diversity in the growth of trees, is not confined to the forest alone; for among the various species of fruit cultivated in this country, there is

a manifest difference in the growth of the trees, even of the same sort, which cannot be attributed to the nature of the soil or situation. This contrast is most frequently observed in new gardens or orchards, where the horticulturist is often surprised to find trees growing to a considerable magnitude, without any symptoms of fruit, while others of the same sort, hardly half the size, are producing fair crops. This, at first sight, appears singular, since the most general method of raising fruit-trees, is by grafting and budding, for preserving the most esteemed sorts; and considering, with Mr Knight, the celebrated horticulturist, that propagating fruit-trees in this way, is but a continuation of the old plant, and such trees must, in some measure, partake of the nature and habit of the original parent.

But, besides this diversity of the growth of individuals of the same kind, there are some particular sorts that are more apt to grow luxuriantly than others, especially those that bear the finer late fruit. That a number of these are shy bearers, is a complaint we frequently hear. Amongst this number, the Colmar, Cresanne, and other fine late pears are placed. If the situation be too high, and cold, for ripening them properly, then there is good reason that they ought not to be cultivated. But, it is almost unpardonable, in this enlightened age of horticulture, to hear the very best fruit condemned as improper to be planted,

either from want of climate, or shyness of bearing in Scotland. The Colmar certainly does attain a high degree of perfection in favourable situations, and the Cresanne will arrive at perfection, wherever the Noblesse peach ripens without the aid of artificial heat. As for the fruit, the Prize Committee of the Caledonian Horticultural Society, can bear ample testimony of its excellent quality and size, as produced at the different competitions.

It is an uncontrovertible fact, that this climate will, and does ripen a number of the finer late pears. It is then evident, that a supply of these fine fruit can be obtained for the table, in the winter and spring months. The Gansel's Bergamot, Cresanne, St Germains, and Colmar, in ordinary seasons, may be found on the table from October until March, and even April, besides several others. But, as these are most objected to as shy bearers, it may be proper to inquire into the cause.

As most of the esteemed sorts of fruit at present cultivated, are accidental varieties, raised from seed at some period or other,—these varieties are longer or shorter lived in the different sorts. An early propensity to bear fruit, is an evident symptom that the sort will be of shorter duration than those that continue luxuriant and unfruitful for a number of years. This unfruitfulness is greatly encouraged by taking scions for grafting, from

an improper part of the parent plant, and placing them on luxuriant stocks. This, at first sight, may be considered too minute a distinction to be of any essential service to the practical horticulturist; but it is certainly of the utmost importance in preparing plants of the finer sorts of late fruit. Besides, in this northern climate, where it requires the best situations to ripen the finer late fruit, the trees are most properly placed on walls. If the sort planted be not debilitated by age, but naturally of a luxuriant growth, the utmost attention is necessary in training the trees, that they may produce fair crops. For, as training trees on walls is an artificial scheme, to supply the want of climate, the more that nature is deviated from, the less success will attend their cultivation in producing crops, more especially some of the finer late pears. If young luxuriant trees of the Cresanne, Gansel's Bergamot, Colmar, or Chaumontelle pear-trees, are planted in a deep rich soil, and in pruning, and training, the knife be used too freely, in removing breast-wood, or correcting any irregularities that may strike the fancy, in a very few years, the trees will be so completely overrun with luxuriant shoots, that it is impossible they can produce any fruit, but a few at the extremity of the branches. But the evil does not rest here, for when young trees are wanted, the scions for grafting are frequently taken from strong shoots near the centre of the trees; and

these, undergoing the same round of management, are equally as unproductive as the former: and yet these sorts are complained of as shy bearers, when, in reality, the most effectual method is, thus unconsciously taken to prevent them from bearing!

If a method had been projected to keep some of the most esteemed late pear-trees unfruitful, that they might be reserved for some future generation, it could hardly have been done in a more complete manner, than by the treatment which some of them have undergone. For, being thwarted in their disposition to fulfil the dictates of nature, in producing blossom and fruit, their vigorous vegetating power has been exerted in producing luxuriant shoots.

If, then, as can hardly be disputed, the raising of young trees by grafting or budding, be but a continuation of the old plant, and the young trees in some measure partaking of the nature and habit of the parent plant, it must be evident, that scions for grafting, taken from the luxuriant breast-wood, near the centre of unfruitful trees, must encourage a propensity to shyness of bearing in the young plants,

Therefore, in raising young fruit-trees, the nature and habit of the different sorts should be particularly attended to; and if they are examined, it will be found that some of them are in a very healthy and luxuriant condition, but with a

natural propensity to barrenness: some are in a healthy state, of a moderate growth, and naturally inclined to bear good crops: others are debilitated by old age, and in the last stage of existence. Among the first number, are the Colmar, Chaumontelle, Cresanne, Gansel's Bergamot, and other fine late pears. In raising young trees of these sorts, the scions for grafting should be taken from young shoots at the extremity of the bearing branches, and placed on stocks of a moderate growth. If the young trees are planted in good soil, in proper situations, and attended to in the operation of pruning and training, there is little doubt but that they will answer the most sanguine expectation in producing fair crops. Among those that are of a moderate growth in the middle stage, are the Sucré vert, Swan's Egg, Muirfowl Egg, Jargonelle, and other good pears: The Nonpareil, Ribston Pippin, and other valuable apples. Even the famous Golden Pippin, of the true Balgone variety, is found in a healthy condition at some places* bearing large crops, (although it is

* In a garden belonging to Mr Ainslie at Peaston, in the parish of Ormistoun, East Lothian, there are two trees of the Golden Pippin apple, of the true Balgone variety, growing on a wall in a most healthy condition. Each tree covers about eighteen feet of the wall in length, and nine feet in height: they annually produce from a hundred to a hundred and twenty dozen of large handsome high-flavoured fruit, and are the admiration of the whole neighbourhood. The situation is high, with very little shelter from the north or east. The soil is a fresh friable loam, on a sub-soil of dry clay.

completely debilitated by age in the sister kingdom.) In raising young trees of these sorts, the scions for grafting should be taken from strong shoots, but carefully rejecting all those produced on trees that have the least appearance of canker. Among those of the last stage, and debilitated by age, are the Nonsuch, Grey Leadington, Oslin Pippin, Hawthorndean, and a number of old apples; the Longueville, and other pears, found in the neighbourhood of old monasteries and abbeys in Scotland. Although these are frequently cultivated, they are seldom long-lived when placed on walls. They frequently produce good crops, and make good temporary trees for filling up empty spaces, when the principal trees are young and in training. In raising young trees of these sorts, the scions should be taken from young shoots near the centre of the trees, where some old branches have been amputated on purpose to produce young wood for grafting.

From the foregoing reasons, it is therefore of the utmost importance, that the habit and disposition of the different sorts of fruit-trees should be understood. For it is a great mortification, at the end of ten or fifteen years, to find the most sanguine expectation blasted, when the trees, in place of remunerating the planter for his trouble and expence, are grubbed up to give place to others, or are cut down to be grafted with others

of a better habit, or that are more congenial to the situation and climate.

But although a proper selection of trees is made, according to the habit and dispositions of the different sorts, yet, if the soil be not congenial to their natures, little good can be expected from them. In cultivating the finer fruit, the quality and depth of the soil should be particularly attended to. For although trees derive most nourishment, when the roots are near the surface, as the sun and air operates with more effect upon them, and become a powerful stimulus to fruitfulness, yet, from the circumstance of the fruit-tree borders being frequently occupied with vegetables, and dug over from time to time, the roots must be kept down almost a foot beneath the surface. Hence, they must either penetrate deep into the soil, or else run far out in search of nourishment, which, in most cases, is attended with very considerable disadvantages. For, if the bottom of the borders is naturally of a dry clay, or artificially formed of a hard substance, which the roots cannot penetrate, they must soon run to the extremity of the borders, and penetrate the walks, which are frequently made of materials not very congenial to vegetation. Or, if the subsoil is gravel, sand, spongy-clay, or any soft substance that the roots can penetrate, the nourishment derived by the trees must have a very vitiating tendency on the quality of the

fruit. Besides, when it is considered that the borders act in a double capacity, supporting both kitchen vegetables and the trees upon a wall perhaps twelve or fifteen feet high, it must be evident, that the borders ought not only to be of good quality, but likewise of considerable depth.

Besides procuring trees of a good habit, suitable to the climate, and placing them on congenial soils, it is necessary that they should be particularly attended to in pruning and training. After a practice of nineteen years in trying various methods in cultivating the finer late pears, that which has been attended with the best success, is from the original formation of the trees, to *exclude breast-wood as much as possible.* This should be attended to in the summer months, when no more shoots should be allowed to remain on the trees than what are wanted to prevent all unnecessary amputation in the winter pruning. In the early part of summer, this is easily performed, by going over the trees from time to time, and pinching off the shoots as they appear. And, although in some cases, when the trees are spurred, it may be necessary to rub the young shoots close off; yet, on the last year's wood, these shoots should be left about an inch long, which will form fruit-spurs, and prevent nakedness.

Among the various trees under my management, a Gansel's Bergamot pear was planted about seventeen years ago. It is a sort well known for

its luxuriant growth. In a short time, it began to grow vigorously, almost every eye of the last year's wood put forth a shoot. After singling out as many as were necessary for forming the tree, the remainder were pinched off, leaving spurs about an inch long. The wall being sixteen feet high, the tree was trained in the half fan form; and by adding three or four pair of branches annually to its height, it soon filled the wall. It now extends forty feet; and from his method of pinching off the unnecessary shoots as they appear, it is completely covered with fruit-spurs, from the one extremity of the tree to the other. Samples of the fruit, among other sorts, have several times been laid before the Committee of the Society, and have frequently met with their approbation. After the tree had filled the wall, the knife was little used, most of the pruning being regulated by the hand in the summer.

A large proportion of Cresanne pears are cultivated at this place. From the circumstance of most of the scions for grafting having been taken from the extremity of bearing branches, and the trees trained in the half fan form *, they seldom fail in producing fair crops. Even in seasons when most of the other fruit are destroyed by bad weather in the spring, and early part of summer,

* A description of this method of training, is to be found in the first number of the Society's Memoirs, pages 84. & 85.

they have a considerable proportion of fruit on them. Most of the trees are of a moderate growth, seldom produce much breast-wood, and bear fruit to the very centre of the trees. In some of them, the young shoots at the extremity of the branches, are frequently shortened in the winter or spring pruning to produce wood, the great object being to extend the trees: When this is gained, there is seldom a want of fruit. They are perfectly healthy, and the canker has never once made its appearance among them.

In order to ascertain the difference between the Colmar and Poire d'Auch, a rider tree was planted five years ago, grafted with a scion taken from the extremity of a bearing branch of a Colmar pear. It has only extended about eight feet, but was completely covered with blossom this season, has a few fruit, and is in a fine bearing state. Two scions of the Poire d'Auch are grafted on this tree, which are equally promising, and of a moderate growth.

Thus, Sir, I have endeavoured to point out the cause of shyness in bearing in the finer late pears, so far as it has come under my knowledge and experience; and I hope my humble efforts may, in some measure, answer the suggestions of that worthy Member of the Society, Colonel Spens of Craigsanquhar, besides raising an emulation in our countrymen to exert their endeavours to

procure a supply of that fruit, so much esteemed in the winter and spring, which it is now placed beyond a doubt that our climate will, and does produce; a remarkable example of which may be seen this season at Pinkie-House, the seat of Sir John Hope, Bart., under the superintendence of my worthy friend Mr James Stewart.

A great deal more might be added on the cultivation of the finer late fruits in Scotland; but as this paper has already been carried to an unreasonable length, I must conclude, by begging your indulgence in recommending to your notice a pear that is not generally known, and very little cultivated in this country, the Sucré vert, which is well adapted to the climate of Scotland. It requires a wall, but is a great bearer, and fit for the table in the end of November and most of December. And am, &c.

ORMISTON-HALL,
1st September 1815.

Note by Sir G. S. Mackenzie.

THE above communication from Mr Smith, and the one he refers to from Colonel Spens, are ex-

peedingly interesting, inasmuch as they relate to the cultivation of one of the most valuable fruits. These gentlemen having done me the honour to communicate to the Society, through me, what has occurred to them, I cannot refrain from making a few observations, which may assist in clearing up the mystery which seems hitherto to have hung over the cultivation of the finer sorts of pears, and to have greatly retarded its extension.

That these varieties will come to perfection in this climate, and that good trees bear abundant crops, ample testimony has been afforded to the Society from Ormiston-Hall, Dalkeith Park, Torry, Pinkie, &c. Nevertheless, Colonel Spens's complaint, that several of the varieties are shy bearers, in situations where the soil and management are good, is well founded. But there are circumstances independent of soil and management, which may probably account for the failure of pear-trees. The condition of the tree from which the grafts or buds have been taken, and that of the stock on which they have been put, may render good management unavailing, and the qualities of the soil altogether useless. It is probable that some such circumstances may obtain, in the case of Colonel Spens's trees. The parent-trees may have been unhealthy,—the stocks in ill condition,—and the grafts or buds may have been taken from breast-wood, instead of bearing branches. After seeing how business is carried

on in nurseries, the disappointments I have met with, and which have occurred to every person who has a garden, need scarcely excite surprise. Many very respectable nurserymen belong to our Society; and I trust that they will not take the observations I make, as if intended to do them any injury. But the confusion which reigns in public nurseries, and the carelessness which is there notorious in the management of fruit-trees, and of which the effects have cost so much, require animadversion and reform; and I consider that, instead of injury, I do a service to nurserymen, by giving them warning, before they lose their characters altogether. I have observed, that the stocks used for grafting, are in general far from being of vigorous growth; no pains is taken to procure grafts from healthy trees which are in full bearing; on the contrary, grafts are often taken from nursery-plants which have never borne fruit; and there is even reason to fear that, in some cases, disease may be considered as a source of profit. When young trees are taken up to be sent to those who have ordered them, they are frequently pulled up almost by main force, and the roots greatly injured. The lists of fruit-trees which are printed by nurserymen, prove for the most part deceiving; for the sorts ordered are seldom obtained when the trees come to bear fruit. I have myself lost little short of twenty years enjoyment, by depending on trees I procured from nurseries. Nothing is so cruel as disappointments

of this sort; for a pear-tree requires ten or twelve years to come into bearing, and lost time cannot be recovered. I believe it to be perfectly true, as I have heard nurserymen assert, that in extensive concerns, it is difficult to prevent confusion and negligence. But I cannot allow any excuse; since I am persuaded, that every gentleman who is about to stock his garden, would willingly pay a guinea for a tree on which he could rely, rather than purchase trash at a shilling or half a crown. No one would grudge the increased price, and it would enable nurserymen to have distinct establishments for fruit-trees. I despair, however, of a complete reform, until the Society shall have established an *Experimental Garden*, in which stock-plants of a select number of varieties of different fruits may be kept, and from which grafts and buds may be supplied, till such time as they may be procured from every well kept garden. Nurserymen will, I doubt not, easily perceive the great importance of such an establishment, and do all in their power to promote it; for there is no other means likely to enable them to recover from the effects of the disappointments which are now every where loudly complained of, and which have driven the proprietors of gardens to raise stocks for themselves, and to procure grafts and buds from trees on which they can depend. Till we possess an experimental garden, (and the time, I would fain hope, is

not far distant when we shall possess it), we cannot expect speculations on the failure of fruit-trees to cease; and amateurs will continue to shift and change their trees, without a prospect being afforded of their ever reaping any enjoyment. In the mean time, it is our business to bestow pains in attending to the preparation of the soil, and to every plan of management which has undergone the test of experiment. And since the evidence of Mr Smith's method of managing pears being effectual, has been repeatedly before the Society, in the shape of most delicious fruit, there can be no hesitation in recommending it to the attention of horticulturists. Let every one, however, be assiduous in endeavouring to procure new varieties from seed, and in contributing in this manner, to render Scotland proud of her native fruits.

XVIII.

On using a solution of Quicklime for destroying Mosses, Lichens, and Insects on Fruit-Trees, and otherwise promoting their Health and Growth.

By Mr Thomas Bishop, Gardener, Methven Castle.

In a Letter to Mr Dickson, Secretary.

(Read 11th January 1816.)

Sir,

I take the opportunity to lay before the Society, a simple but efficacious remedy for destroying the various mosses and lichens, which are generally found to infest fruit-bearing-trees and shrubs, in damp and confined situations, whilst the application thereof, is succeeded by an extraordinary renovation of health and vigour in the trees.

The pernicious effect that all parasitical plants have on fruit-trees,—in robbing them of their juices,—in impeding the free circulation of air,—and in harbouring a numerous progeny of insects,

&c., hath been duly estimated by not a few of the most able enquirers into nature. The celebrated Sir Humphry Davy styles them, " the most formidable of the enemies of the superior and cultivated vegetable species." And Mr Knight, in his Treatise on the Culture of the Apple and Pear, equally well aware of their injurious effects, ranks them as a disease concurrent with the age of the variety of fruit, hastening to decay. But, contrary to what I have now to advance, he says, " that it can only be destroyed, by removing the cause to which it owes its existence ;"—which, indeed, would be a very hopeless attempt in many situations, where the evil is most predominant. But the remedy which I have to recommend, will effect a complete cure, without regard to the causes from which they originate, or those which tend to their support; and of which, any person making trial, will have sufficient evidence in twenty-four hours after its application.

At any convenient time between the fall of the leaves, and re-opening of the buds in spring, when the trees are *perfectly dry*, take a quantity of quick-lime, either in shells, or recently slaked, and thereof make a strong solution or mixture with water. Immediately apply the same as a washing to the trees infected, either by means of a watering-pot with a wide rose, on the lower trees and bushes, or with a common garden-engine to those of greater height. If there are many trees to be

washed at a time, it is better not to make up the quantity of liquor at once, that may be necessary to wash the whole, but to add occasionally more lime and water into the vessel, stirring it frequently when used. The effects of this remedy will first appear, by changing the colour of the lichens to a darker green, and whenever the rays of the sun alight upon them, they will assume a brown colour, and shrivel up as if scorched with fire; from which time, they cease to draw any more nourishment from the trees, but will, in a few months begin to drop off, and will wholly disappear before the ensuing winter, when the bark of the trees will regain a smooth glossy appearance; and the vigorous shoots of next summer, will clearly exhibit the deliverance afforded them.

My first experiment as to the efficacy of the above remedy, was made in winter 1811, upon a plot of gooseberries fifteen years old, which were literally *white* with lichens, and had ceased to make young wood. The water was made as thick with lime as could be applied through the rose of a watering-pot, which had its holes considerably enlarged for that purpose. Their appearance in a few days, removed every doubt as to the result of the experiment, in perceiving the difference between those lichens which had been fully saturated with the liquor, and others which had escaped the application. Afterwards, I gave them a second washing on account of such as had been

missed at first. They are now quite clear of their burden, and have for these two years past, made as luxuriant shoots as could be wished for, from bushes in a full bearing state.

In spring 1812, I washed on one side *only*, a number of apple and pear espaliers, which were very much overgrown with mosses and lichens; even the larch-poles to which they were trained, were covered with tufts several inches long. The consequence has been, that all the lichens on that side, and as far as the solution had access to the other, either on the trees or poles, are completely destroyed, whilst those on the opposite side, that escaped its influence, continue unaltered; notwithstanding which, these trees have greatly improved in growth and fruitfulness.

Last spring, I washed several full grown standard-trees, with the same solution, by means of a force engine, and have found its effects uniformly the same as above stated. The flower-buds on some of these trees, were about to open, yet it did not appear that they were hurt in the least degree by the causticity of the lime, but rather benefited; for I am inclined to agree in opinion with your correspondent, Mr Sinclair at Woburn Abbey, that several insects lay their eggs in the scales of the flower-buds, which in time find their way to the interior of the flower, and by destroying those parts destined to fructification, are, amongst other causes, the occasion of

the frequent blights that take place among fruit-trees. As the application of lime in a powdered state, has been found by him, (as stated in his communication to the Society, read the 26th of March last), to be an excellent preventive of such blights, it must be evident, that its application in a liquid state, will have a greater power to destroy the insects that occasion them. For the causticity of lime is only brought into its full effect, when connected with moisture. This mode will also render that tedious process unnecessary, which he hath recommended, of displacing the lichens from the trees previous to liming them. I have observed none which have not been obliged to give way to the remedy proposed, when applied of sufficient strength. I am, &c.

METHVEN CASTLE,
13th November 1815.

XIX.

On propagating the Double Rocket by Cuttings,

By Mr Duncan Robertson, Gardener, Megginch Castle,

In a Letter to Mr Neill, Secretary.

(Read 11th January 1816.)

Sir,

The Double Rocket is a beautiful plant, rather scarce in this part of the country, owing chiefly, I suppose, to florists not being acquainted with a successful way of encreasing it. I had a few plants of rocket under my care, and I did them all justice, as I thought; but all would not do; I lost them all. I tried to part their roots, but being small and weak, the slugs cut them all up in a short time, as slugs are very fond of them, especially of their leaves. I tried to encrease them by cuttings in the common way, with as little success. This led me to try another method, which I would recommend to your Society, as a never-failing

way of propagating this beautiful flower. If a person has but one plant of rocket, and is anxious for its flowers, the first thing is, after the flower is beginning to fade, to cut down the stalks and divide them into ordinary lengths of cuttings; next to cut off the leaves and smooth the ends; then to make three slits with a knife in the bark or rind, longways, so as to separate or raise the bark for half an inch in length. When the cutting is inserted in the ground, the loose bark naturally curls up; and it is from this bark that the young roots proceed. The partial separation, and the turning up of the bark, seems to promote a tendency to throw out roots.

The cuttings may be put into flower-pots, as they may thus be sheltered during winter with more ease; or they may be placed in the natural earth, provided the soil is light and fresh. Covering them with a hand-glass, will forward the rooting of the cuttings; or with the aid of a hot-bed, they will succeed excellently. I have used this simple way for six years past, and never without success,—not one in twenty having failed.

This method, it may be remarked, will hold good in cuttings of Stock-Gillyflowers, and Double Wallflowers. I am, &c.

Meggingh Castle,
July 5. 1815.

XX.

A method of Cultivating Asparagus practised in France.

Communicated by Dr MACCULLOCH.

(Read 11th January 1816.)

THAT part of the garden which is longest exposed to the sun, and least shaded by shrubs and trees, is to be chosen for the situation of the asparagus quarter. A pit is then to be dug five feet in depth, and the mould which is taken from it, must be sifted, taking care to reject all stones, even as low in size as a filberd nut. The best parts of the mould must then be laid aside for making up the beds.

The materials of the bed, are then to be laid in the following proportions and order:

6 inches of common dunghil manure,
8 inches of turf.
6 inches of dung as before,
6 inches of sifted earth.
8 inches of turf.
6 inches of very rotten dung,
8 inches of the best earth.

The last layer of earth, must then be well mixed with the last of dung.

The quarter must now be divided into beds five feet wide, by paths constructed of turf, two feet in breadth, and one foot in thickness. The asparagus must be planted about the end of March, eighteen inches asunder. In planting them, the bud, or top of the shoot, is to be placed at the depth of an inch and a half in the ground, while the roots must be spread out as wide as possible, in the form of an umbrella. A small bit of stick must be placed as a mark at each plant, as it is laid in the ground. As soon as the earth is settled and dry, a spadeful of fine sand is to be thrown on each plant, in the form of a molehill. If the asparagus plants should have begun to shoot before their transplantation, the young shoots should be cut off, and the planting will, with these precautions, be equally successful, though it should be performed in this country even as late as July. Should any of the plants originally inserted have died, they also may be replaced at this season.

The plants ought to be two years old when they are transplanted; they will even take at three; but at four they are apt to fail.

If it be necessary to buy asparagus plants for these beds, it will be proper to procure twice as many as are required. The best must then be selected for planting, and the remainder placed in some remote portion of the prepared bed, or into a similar situation, but without separating the plants. Here they must first be covered with four inches of sand during the summer, and as soon as the frost sets in, with six inches of dung over that.

The stems of the planted asparagus must be cut down as soon as the frost commences, and close to the ground. The beds are then to be covered with six inches of dung, and four of sand. In March, the bed must be stirred with a fork, taking care not to approach so near to the plants as to derange them. Towards the end of April, the plants which have died, may be replaced with the reserved ones lately described.

In three years, the largest plants will be fit to cut for use. If the beds be sufficiently large to furnish a supply in this manner, the asparagus shoots should be cut as fast as they appear, otherwise they must be left till the quantity required has pushed forth, in which case, the variety in co-

lour and size prevents them from having so agreeable an appearance. An iron knife, of the shape here represented, is used for this purpose.

In cutting, this knife is to be slipped along the stem, till it reaches the bottom of the shoot, where the cut is to be made. At the end of four years, the great and small ones may be taken indiscriminately. The cutting should cease about the end of June.

At the beginning of winter, the stems are all to be cut away, and the beds covered with dung and sand, in the manner above described. If muddy sand from the sea-shore can be procured for the several purposes above described, it is the best; otherwise, river sand may be used; and if that cannot be procured, fine earth must be substituted.

The asparagus bed now described, will generally last thirty years; but if they be planted in such abundance, as to require cutting only once in two years, half the bed being always in a state of reservation, it will last a century or more. The turf used in making the beds, should be very free from stones.

Care must be taken not to tread on the beds, so as to condense the earth in planting the asparagus; and to prevent such an accident happening on any other occasion, a plank should be used to tread on. It must be remembered, that the division of

the beds, which is formed by thick turf, is intended to prevent the condensation of the earth below, in consequence of the necessary walking among the beds. As in the course of time, this condensation will gradually take place, the turf ought to be renewed every three years, for the purpose of stirring the ground below; and in applying the winter coat of manure, it must be remembered, that even these walks are to be covered. If these circumstances are not attended to, or if the earth below the walks has not originally been constructed in the way described above, the asparagus plants which grow near the walks, will be much less fine than those in the middle of the beds.

N. B.—I understand that this plan has been put in practice by Mr Allan of Tweedside, with success.

XXI.

Horticultural Gleanings.

Communicated by Sir G. S. MACKENZIE,

To the Secretary.

SIR,

IT has occurred to me, that it would be of use to many gardeners who purchase our cheap volumes, to possess abstracts of useful hints thrown out in other, but more expensive works; such as the Transactions of the London Horticultural Society, in which much valuable information is contained. With such a view, I now send to you some Gleanings from the work just mentioned, and from other sources; and if the Council shall deem them of sufficient importance, I shall be glad to see them occupy a portion of the Memoirs. I am, &c.

G. S. MACKENZIE.

New and Early Fruits.

No department of horticulture presents so wide a field, nor one so fraught with pleasure and profit, as the production of new and early fruits. "Nature, (says Mr Knight), has given to man the means of acquiring those things which constitute the comforts and luxuries of civilised life, though not the things themselves; it has placed the raw material within his reach; but has left the preparation and improvement of it to his own skill and industry. As every species of fruit acquires its greatest degree of perfection in some peculiar soil or situation, and under some peculiar mode of management, these are the first objects of the improver's pursuit; *and nothing should be neglected which can add to the size, or improve the flavour of the fruit from which it is intended to propagate.*

"The seedling offspring of plants, have a constant tendency to adapt their habits to any climate in which art or accident places them.

"But the influence of climate on the habits of plants, will depend less on the aggregate quantity of heat in the year, than on its distribution in the different seasons. The aggregate or average

temperature of Britain, and of that portion of Russia between the same parallels of latitude, probably does not differ much. But, in Russia, the winters are intensely cold, and the summers are extremely hot, and the change from the one to the other is sudden. In Britain, the winter is seldom severe, and spring advances slowly and irregularly. In Russia, vegetation begins suddenly, and proceeds rapidly; in Britain, its commencement is scarcely perceptible, and its progress is slow. The Crab is a native of both countries, and has adapted its habits to each. The Siberian variety, introduced into our country, retains its habits, and expands its leaves and blossoms on the first approach of spring, and vegetates strongly, when our own Crab scarcely shews signs of life.

"Similar causes produce similar effects on cultivated annual plants; and seeds, which have acquired maturity in a warm climate, produce plants which come to greater perfection in a colder one, than those which spring from seeds produced by successive generations on the same spot. Hence, the practice of changing seed, so common among farmers, an which has been found so useful.

"The value of early crops, has attracted the attention of the gardener to early varieties of many esculent plants; but, in the improvement of these, he is often more indebted to accident than to systematic culture."

The first attempts to obtain early varieties of fruit, appear to have been made by Mr T. A. Knight. He first subjected the Apple to experiment. He found that the plants produced from seeds taken from fruit which grew on a wall, yielded ripe fruit earlier than plants from seeds of the same fruit produced in an orchard. The blossoms of one kind were fecundated by those of another; but Mr Knight does not attribute to this, the earlier maturity of the new fruit. In producing new apples for the press, Mr Knight has been eminently successful, by crossing some of our richest apples with the Siberian Crab.

He next made experiments on the Grape; and though not so successful in producing good varieties, he has been fully confirmed in the principles on which he proceeded. A vinery in which no fires are made in the winter, affords to the vine a climate similar to that which the southern parts of Siberia afford to the apple or crab tree: in it, a similarly extensive variation of temperature takes place; and the sudden transition from great comparative cold to excessive heat, is productive of the same rapid progress in the growth of plants, and the advancement of the fruit to maturity. By impregnating the blossom of one variety with those of another, Mr Knight has obtained some hardy and early varieties, which, though not fit for the dessert, are nevertheless good for the press; and some also which are fit for the table.

He has also made experiments on the Peach, in which there is every promise of success. He has a great number of seedling Pears, respecting the fruit of which, we shall be informed in due time.

Mr Knight concludes his first paper on this subject, which was read to the London Society in 1806, with the following remarks;

"New varieties of fruit will generally be better obtained by introducing the farina of one variety into the blossom of another, than by propagating from any single kind. When an experiment of this kind is made, between varieties of different size and character, the farina of the smaller kind should be introduced into the blossoms of the larger; for, under these circumstances, I have generally (but with some exceptions) observed a prevalence, in fruit, of the character of the female parent; probably owing to the following causes. The seed-coats are generated wholly by the female parent, and these regulate the bulk of the lobes and plantula; and I have observed in raising new varieties of the peach, that when one stone contained two seeds, the plants these afforded, were inferior to others. The largest seeds, obtained from the finest fruit, and from that which ripens most perfectly and most early, should always be selected. It is scarcely necessary to inform the experienced gardener, that it will be necessary to extract the stamina of the blossoms from which

he proposes to propagate, some days before the farina begins to shed, when he proposes to generate new varieties in the manner I have recommended. When young trees have sprung from the seed, a certain period must elapse before they become capable of bearing fruit; and this period, I believe, cannot be shortened by any means. Pruning and transplanting are both injurious; and no change in the character or merits of the future fruit can be effected, during this period, either by manure or culture. The young plants should be suffered to extend their branches in every direction, in which they do not injuriously interfere with each other; and the soil should just be sufficiently rich to promote a moderate degree of growth, without stimulating the plant to preternatural exertion, which always induces disease. The soil of an old garden is peculiarly destructive."

In a memoir on the peach, Mr Knight recommends that those fruits, from the seeds of which new and early varieties are to be derived, should be brought to maturity within as short a period as possible, consistent with their attaining their full size and perfect flavour.

The peach does not, like many other species of fruit, much exercise the patience of the gardener who raises it from seed; for it may be always made to bear when three years old; and there is something in its habits, which induces Mr Knight

to believe, that it might be made to bear at two years old. He recommends, that the seedlings should be retained in pots, and buds from them put on other trees; for their rapid growth on walls is very troublesome, and pruning is death to them.

I have lately received from Mr Knight the following general outline of the hypothesis he has advanced, and it may be said, proved, respecting the growth of such plants as have leaves and bark:

"A seed, is a bud which has been detached from its parent, with so much sap, or vegetable blood, as will feed it till it has formed organs to absorb and digest its proper food; and the cotyledons form the reservoir in which this sap is deposited. Of this material, the first true leaves are formed; and as soon as these are full grown, the plant can live without the cotyledons or seed leaves. But if the seed-leaves be taken off before the true leaves are sufficiently grown, the plant perishes, as Bonnet and Duhamel proved before me *. I have added the last proof, that if

* A very slight injury done to the seed-leaves, produces the same effect. I lately bruised slightly the seed-leaves of an apple, and observed disease gradually advance till, in about a fortnight, the leaves were entirely gone. The true-leaves had made no progress, though the stem appeared still fresh. On taking up the plant, I found that the root had also been destroyed by disease.
G. S. M.

the first formed true leaves be destroyed as soon as they have entered on their office, the young growing leaves above, immediately languish and perish. Whence I have inferred, that as the cotyledons fed the first leaves, so these first true leaves, when mature, prepared food for others. I contend, and I think I have proved, that the sap ascends in the mature part of the tree, (I here exclude the succulent shoot), through the sap-wood, and that it descends down the bark, depositing the matter of the new wood in its descent, but without being changed into it. I also contend, that the matter absorbed from the soil and air, is converted into the sap or blood of the plant wholly in the leaves, from which it is discharged into the bark; and that such portions of it as are not expended in the generation of new wood and bark join, during the spring and summer, the ascending current in the wood, into which it passes by the medullary processes, as they have been very improperly called. As the autumn approaches, however, and the ascending sap is no longer expended in generating new leaves and blossoms, or young shoots, that fluid accumulates in a concentrated state in the sap-wood of the tree, as in the tuber of the potato-plant, and the bulb of the tulip; whence it is washed out in the spring to form a new layer of bark and leaves, and to feed the blossoms and fruit.

I have recently obtained decisive evidence of the return of the sap from the leaf, and of its powers on its return to generate new wood and bark; and I propose in the present autumn (1815), to send an account of this experiment, with some others, to the Royal Society. Whether my hypothetical opinions be true or false, I can safely assert, that I have been, during several years, able to foresee in every case, the result of every experiment I have made, and these have been very numerous; and, therefore, I feel confident, that my opinions, if not quite correct, are nearly so. A very able German writer, Kieser, who has recently published an examination of the opinions of different writers on Vegetable Physiology, very confidently adopts my opinion relative to the ascent and descent of the sap, and its preparation in the leaf, and its mode of generating wood."

Wine.

Mr Knight has succeeded in producing a very close imitation of White Burgundy, by using the unripe grapes thinned from his vinery, when about the size of large peas. Two and a half pounds of loaf-sugar for each gallon of its contents, are put into the cask, and as much water is added to each quart of bruised grapes, as will make a gal-

lon of liquor. No particular care is necessary, as the wine will fine itself.

Recipe for Stopping the Bleeding of Vines.

To four parts of scraped cheese, add one part of calcined oyster-shells, or chalk burnt to lime. If this mixture be pressed into the pores of the wood, the sap will instantly cease to flow. Of course, the longest branch may be taken off at any season with safety.

Cultivation of the Melon.

There is scarcely a fruit which so seldom arrives at perfection as the melon, and of which the management, in general, is so contrary to the natural habits of the plant. We have seen in the account of Mr Knight's hypothesis, of how great importance the leaves are to the health and vigour of every plant. Those of the melon, as of other plants, arrange themselves so as to receive the greatest possible quantity of light. If they be disturbed from that position, it is evident that injury will follow; because the branches are slender, and the leaf-stalk long, while the leaves themselves are heavy. Mr Knight was so convinced

that the usual treatment of melons was improper, that he paid particular attention to the method pursued by his own gardener, and those of his neighbours. To remedy the defects which he observed, he placed his plants at greater distances, putting a single plant under each light, the glass of which was six feet long by four wide. The mould was as usual covered with brick-tiles, over which the branches were conducted in every direction, so as to present the largest possible width of foliage to the light. The branches were secured by means of small pegs passed into the mould between the tiles, and the leaves were also held erect, and at an equal distance from the glass. As the leaves sustain great injury from the common method of watering, which removes them from their proper position, the water was poured upon the tiles from a vessel of a proper construction, so that the water never touched the leaves. By such simple management, the fruit grew with extraordinary rapidity,—ripened in an unusually short time,—and acquired a degree of perfection, which Mr Knight had never before seen. If, however, a sufficient quantity of fruit has set, the further production of foliage should be prevented, by pinching off the lateral shoots as soon as formed, wherever more foliage cannot be exposed to the light. No part of the full-grown leaves should ever be destroyed, however distant from the fruit.

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I hope at a future time to communicate another set of gleanings. I trust, that others, when they meet with facts not generally known, will follow my example, in disseminating them, through the medium of our Memoirs.

XXII.

On the Cultivation of Broccoli.

By Mr WILLIAM WOOD, Gardener at New Gardens, near Queensferry.

In a Letter to Mr NEILL, Secretary.

(Read 28th December 1815.)

SIR,

THE improvement of the sorts of broccoli already cultivated, and if possible, the acquisition of new varieties, has, for about these forty years past, occupied a considerable degree of my attention; and I am happy to inform you, that in both I have made very considerable progress. I shall state the plans I have pursued.

1*st*, In preparing the ground for the plants from which the seed was to be saved, I tried manure from the public roads; but found that, though this made the plants grow very strong, they produced but small heads.

2d, I next made a compound of the road-rakings, sea-weed, and horse-dung; this answered much better than the former, and my broccoli was considerably improved.

3d, In November, I gave the quarter on which I intended to plant broccoli, a good manuring of sea-weed, and dug it up rough. In spring, I again repeated the same. Previous to planting, I pointed over the ground. This mode produced the largest and finest heads I had seen during a practice of fifty-four years; indeed many gardeners of extensive practice, came to see them, and all declared them to be the finest they had ever seen. I was at that period, gardener to the late Alexander Wood, Esq. of Seafield; and one of your worthy Vice-Presidents, (a visitor of my Master), said that it exceeded any of the kind he had ever seen.—I allude to Dr Duncan *senior*.

4th, A compound of the cleanings of old ditches, tree-leaves, and dung, I have found preferable to all other manures for maturing broccoli. From this stock, I saved the seeds that I gave to some of my particular friends, who have supplied the market.

The process in saving the seed, is as follows:—I carefully select the largest, best formed, and finest heads, taking particular care, that no foliage appears on the surface of the heads; those I mark; in April I lift and lay them in by the heels, with a good watering. Lifting, prevents them from pro-

ducing *proud seed*, as it is called,—I mean from degenerating. When the head begins to open or expand, I cut out the centre, leaving only four or five of the outside shoots to come to seed. This method produces seed the most genuine of all the others that I have tried; and I can confidently recommend it to every saver of seeds of broccoli.

I have always found the Sulphur Broccoli the most difficult to procure seed from. In 1810, I laid down two heads of Purple, and two heads of Green Broccoli together, to save seed from. They produced two kinds, the first a large pyramidal head, dark-green; and, the second a dwarf flat head, very handsome pale-green. I have now five new varieties, produced by crossing those already known. I am, &c.

NEW GARDENS,
April 4. 1815.

XXIII.

On promoting the Fruitfulness of Fruit-Trees, by Cutting their Roots.

By Mr William Beattie, Gardener at Scone.

In a Letter to Mr Dickson, Secretary.

(Read 11th January 1816.)

Sir,

In my last communication to the Horticultural Society in 1811, I gave some account of an experiment I had made on some pear-trees, to promote their early bearing, by cutting their roots soon after mid-summer; and I promissed to communicate the result of further experiments of the same kind, which I intended to make on the same principle; first experiments of any kind being seldom considered satisfactory, and certainly with more propriety relied on when they have been repeated, and the results found to correspond.

In furtherance of this plan, in the beginning of July 1811, I had a border on the south wall of 400 feet long, trenched to the depth of from 2½ to 3 feet; in doing this, I had the opportunity of cutting the roots of all the trees, as the work went on, which I did so completely, that they in a manner hung by the nails and shreds, with a ball of earth of about two feet from the stem of the tree. As the trenching went on, the earth was replaced, and a good watering given to each, as the weather at the time was extremely dry; but a fall of rain happening, that part of the operation was afterwards thought unnecessary, and discontinued. The trees consisted of Nonpareil, and Golden Pippin Apples; Cressane, Colmar, Spanish Bergamot, Poire d'Auch, Winter Boncretien, and Jargonelle Pears; an Autumn Bergamot, and Golden Beurré. Those on which the experiment was first tried, were on the same wall and aspect, as those now mentioned. The roots of those formerly subjected to cutting, I examined (out of curiosity,) and was a good deal surprised at the length they had run. I even suspected they had been missed in the cutting, until I convinced myself, by examining nearer the stem of the tree, and found the place where the old root had been cut, with a number of fine young fibres from it.

It may not be improper to mention here, that care is necessary in cutting the roots of trees;

they ought to be cut with a sharp instrument, (not chopped off with the spade, as is perhaps too generally the case,) and smoothed over with the knife afterwards; and according to an old observation, sloping the cut a little upwards. For I have observed, that where any had been cut or bruised with the spade, there was a sort of burr or knot on the end of the root, and the fibres that came from it were a good way back and weak; while those that had been cut smooth and inclining upwards, were strong and vigorous for the most part on the upper side, and close to the cut, of course fully nearer the surface than before. Therefore, by cutting the roots of pear-trees, an important point is gained, when it destroys their tendency to go downwards, especially where the soil is wet at bottom, or of bad quality; in any case this is of great benefit to their future success.

Having given the method (perhaps rather too minutely) that I pursued in cutting the roots, I shall give an account of my success in rendering the trees more fruitful. In spring 1812, they were full of blossom, and a fair crop followed for the age and size of the trees, they being only planted in 1806. In 1813, there was an extraordinary show of blossom, but very little fruit followed, owing probably to the wet spring. In 1814, there was a very fine crop of fruit.

The Colmar and Poir d'Auch, are among the best of the winter pears we have, but I believe the longest of any, before they come to a bearing state; by the foregoing treatment, however, they were rendered equally forward with any of the other kinds. I have only to regret, that I did not try the experiment on some other trees of the same kind, and on the same aspect, with a view to ascertain what difference, if any, there would have been in cutting their roots, either in winter, spring, or at midsummer,—as I have supposed the last to be the best time; but this year I am trying the experiment at all the above seasons. It may be necessary for me to add, that all the trees here are trained in the fan manner, excepting the Jargonelle Pear: this plan, in my opinion, is the best for procuring fruit, near the stem of the tree, as there is an opportunity of always laying in young wood as shoots for that purpose.

In a paper presented to the Society by the Honourable Baron Hepburn, there is one paragraph, which I think merits particular attention. What I allude to is the question or conjecture, whether pear-trees may not have some roots peculiarly directed by nature, to search for the food, to nourish fruit or blossom-buds, and other roots to collect food for wood-shoots. The Honourable Baron's idea or conjecture is perhaps new, but nevertheless well worthy of attention, and experiments ought to be made, if possible, to ascertain

the fact. May not the small lateral roots that arise from the large ones, be those that supply the fruit-buds? May not also the large and luxuriant roots extract and convey a kind of sap of a coarse quality, only fit for the production of wood? As cutting the roots of fruit-trees has a tendency to make them fruitful, that may possibly proceed from the quantity of small fibrous roots produced by the operation. I acted on the principle of depriving the tree of the means of conveying such a great quantity of sap, thereby preventing it from growing so much to wood, and of course inclining it to become more fruitful; but I may possibly be attributing the effect to a wrong cause, and it may be from the great quantity of small fibres produced, as before stated. All trees in general, when young, have fewer fibrous roots than when old; pear-trees, in particular, are very destitute of them, until they are transplanted from the nursery, and even afterwards, till of eight or ten years of age. Perhaps hence arises their barrenness till near that time.

The above are merely hints that have struck me since reading the Honourable Baron's conjecture, which I think well worthy of being investigated, if possible, by those whose habits and science much better qualify them for the task. I am, &c.

Scone,
15th March 1815.

XXIV.

On Forcing-Houses, and on the practicability of employing Radiant Heat.

By Sir G. S. Mackenzie, Bart.

(Read 12th March 1816.)

I have already submitted to the Society the form of a forcing-house, which, on trial, appeared to me to be well adapted to those cases in which much expence could not conveniently be incurred, and which seemed to offer to market gardeners the means of increasing, in a given space, the quantity of surface on which plants might be trained. Since doing so, I have re-perused the memoirs of Mr Knight and Mr Wilkinson, in the first volume of the Transactions of the London Horticultural Society, on the best form for the glass roof, so as to admit the greatest possible quantity of the sun's rays; and I sent a memoir to that Society, the object of which, was to point out a portion of a sphere, as that form which would receive the

greatest quantity of light at every season of the year, and at all hours when the sun shone. The fourth part of a sphere, or a semi-dome, while it has a most elegant appearance, is also practicable in its construction for a forcing-house, though at first it may seem to present insuperable difficulties. By forming the ribs of the dome, which are also the astragals for receiving the glass, of cast iron; and setting them in a frame, divided in the middle, on rollers; the whole may be opened up at once, and the plants within exposed to the full advantage of the sun and air, when that may be deemed advisable. This form is not, however, well adapted for training any other plants except vines; but it admits those growing in pots; nor does it allow conveniently of a greater extent than a radius of fifteen feet. Thirty feet of back wall is, however, as large perhaps, as is necessary for a single house of a spherical form, the surface for training on being much greater than that of a house of the same length, with sashes of the common shape. But this form will be attended with considerable expence; and, therefore, I proceed to call the attention of the Society to some circumstances, which appear to me of some importance, in the construction and management of ordinary hot-houses.

Mr Knight, in his memoir on the first of these subjects, attaches great importance to the admis-

sion of the sun's rays without the intervention of the glass, at the period when the fruit is about to ripen. The experience of every person conversant with horticulture, teaches him, that the flavour of fruit growing in the open air, is in general greatly superior to that ripened in a forcing-house. But gardeners are not agreed as to the cause of the inferiority of hot-house fruit. In the memoir I have referred to, as having been sent to the London Society, I ventured to assert, though without having made any direct experiments, that the superior flavour of fruit growing in the open air was to be ascribed, not so much to the influence of the direct rays of the sun, as to the process of ripening being more tardy in the open air, and on that account being more perfectly accomplished; while the rapidity with which fruit arrives at maturity in a forcing-house, where the air does not circulate freely, causes an imperfect completion of the process of ripening. But without stating any theory on the subject, I may refer to a fact which is embraced by every body's experience, and which had not occurred to me at the time I communicated my opinion to our sister Society. We have all observed, that though fruit arrives to a greater size on a wall, its flavour is not nearly so fine as that of fruit which grows on standards. I may refer particularly to the case of the Muirfowl Egg pear. Now, it is evident that, on a wall, the leaves and fruit have full and free

exposure to the uninterrupted rays of the sun, while in standards, this advantage is by no means so great, on account of the shade occasioned by the irregular growth of the branches and leaves. But on a standard, the fruit has every advantage of a circulation of the air. Hence, it appears to be reasonable to conclude that, in a forcing-house, a free and copious circulation of air, is an object of greater importance than the admission of the rays of the sun, without the intervention of the glass. I may here allude to a fact, which I have often heard stated by persons who have eaten pine-apples in their native climate, that those raised in our own country under glass, are greatly preferable; and there can be little doubt of Mr Knight's observation being correct, that, by judicious management, we may raise peaches and other delicate fruit, in a degree of perfection, surpassing that which they usually attain in their native countries *.

Whether the direct rays of the sun, or a free circulation of air be of the greatest importance in

* The great importance of sun-shine, the effects of which are so visibly impressed on fruits and flowers, whenever a fine summer takes place, renders our climate, which is blessed with only a scanty proportion of it, a reasonable subject of lamentation to the gardener. The inferiority of our climate is, without doubt, caused by want of sun-shine, owing to the frequent intervention of clouds and mists, which, in the temperate regions, so often characterise insular situations.

the cultivation of fruit in forcing-houses, remains, however, a fair subject for experiment. Nevertheless, I feel almost confident, that I am not far wrong in considering fresh air as of the first importance. I do not mean to assert, that it would be of no advantage that glass should transmit every ray that strikes it; but that, with a proper circulation of air, the loss of light occasioned by the intervention of glass, is not of that degree of importance, to render the exercise of ingenuity necessary in contriving means of removing the glass without risk at pleasure; nor to interfere with the great saving of expence, both in the construction of the sashes, and in breakage, which obtains by having the glass immoveable.

I agree with Mr Knight in regard to the degree of inclination which should be given to the lights; but I am doubtful if any disadvantage, as he supposes, arises from having a certain extent of upright glass in front. To have none, is certainly a saving of expence; but when we consider, that small front sashes do not diminish the quantity of light, though they do not add much; that they greatly facilitate ventilation; and that they give a finished look to the exterior of the houses, we must allow, that mere economy is not a sufficient reason for banishing front lights.

I have already stated that, in the form which is a portion of the sphere, the whole interior may be exposed by the removal of the frame in a safe

and simple manner; but in no other form can complete exposure be given, without removing the frame in a way which is exceedingly hazardous and troublesome. As the form of an inclined plane is the least expensive, and as it is easy to create as great a circulation of air as may be required, to a house of the usual construction, I am inclined to think, that most people will be disposed to run the risk of losing a little flavour in their fruit, (a risk, in my opinion, not very great), in preference to incurring much original expence in constructing sashes with complicated movements, and continual loss arising from the unavoidable breakage occasioned by moving, taking off, and replacing them. I remain, therefore, of the opinion I formerly expressed, that the inclined sashes may be fixed, and remain both during summer and winter. If the glazing be properly done, very little damage need be feared from frost cracking the glass. It is probable that inequalities in the putty, by obstructing the equal contraction and expansion of the glass, do the principal mischief. The putty ought, therefore, to be carefully mixed up, and well wrought. It appears to me, that a little additional expence in making the astragals, might prevent damage from frost altogether. Let each astragal consist of two pieces, between which the glass is to be laid, resting on a slip of flannel soaked with thin white lead paint, a similar slip being laid over it; and let the whole be made firm by screwing on the

upper pieces of the astragals. By these means, the glass would have more freedom in expanding and contracting, than when made fast by putty. This, however, may not be so practicable, as it appears to be on the first occurrence of the idea.

The inclination which Mr Knight has found to be best suited to latitude 52°, is 34°. Hence, the elevation for every higher degree of latitude, may be found by adding 39′ for every degree above 52°; thus, rejecting seconds, for latitude 53°, the inclination of the sashes should be 34° 39′; for 54°, 35° 18′, and so on. It will also be observed, that if the width of the house remain the same, the height of the back wall will increase a little as we go north.

With regard to ventilation, I have no cause to alter my opinion as to the best manner of effecting it, which I consider to be by opening the front sashes below, and corresponding apertures above. I believe, however, that the method which I put in practice for opening the house above, by having a short sloping roof, is not so good as that of sliding shutters placed in the back wall, to be opened and shut by means of a counterpoise in the manner of a common window. Sliding sashes may be placed likewise in the ends of the house. Supposing that the sliding front, and end sashes, be two feet high, a house 40 feet long will admit of 50 square feet being opened below, besides the doors. The same extent is not necessary above.

Nothing seems to have been more attentively considered, without advancing much towards perfection, than the method of heating forcing-houses. In this department, there is still ample room for improvement; and much time may yet elapse before we reach the *ne plus ultra*. It is obvious that, in the common methods, a vast quantity of heat is wasted; in other words, that much fuel is expended, which contributes but little of its heat to the proper object. Wherever the furnace is placed, the whole of the *radiant heat* which proceeds from it is lost. An open fire place within a vinery, occurred to me long ago as a desideratum. But I could not think of any construction which would not be accompanied with a want of cleanliness and neatness. I have recently, however, seen a contrivance for a chamber fire-place, which puts it, I think, in our power to have the fire within a forcing-house for vines at least, and to derive advantage from the whole *radiant* heat, as well as that obtained from the passage of heated air through the flues. From this, it is plain, that a great saving of fuel may be made; and it will probably appear, that the heat may be more completely under command.

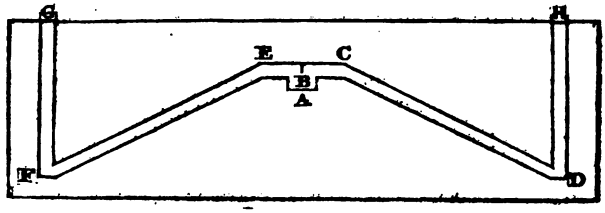
The fire-place alluded to, consists of an ordinary grate, below which is a box, with a moveable bottom. The box and grate are filled with coals, which are lighted at the top; and as they are consumed, a supply is brought from below, by

turning a winch, which raises the bottom of the box. In this way, the fire will continue while the fuel in the box lasts, to present a uniform red surface. If it be desired to diminish the heat, the fuel may be lowered. This kind of grate, invented by a London artist, is manufactured under his patent, by Mr Robertson, High Street, Edinburgh, in whose shop it may be seen in use. The orifice of the chimney, is about three inches wide, extending from side to side, close to the top of the grate; by which means, the draft of air acts powerfully on the surface of the fuel, and causes the smoke to be consumed; an advantage of great value in a hot-house, where so much trouble is usually occasioned by the necessity of frequently cleaning the chimneys. The consumption of the smoke, by keeping the inside of the flues clear, will also enable more heat to pass through them; and thus so many advantages seem to be combined in this grate, that whoever first tries it in a vinery, will, I am fully persuaded, bestow a lasting benefit on horticulture. It need scarcely be mentioned, that this grate appears also well suited for flued walls, from its property of consuming the smoke; and that it is preferable for hot-houses in general, whether the fire be on the outside, as must be the case in peach-houses, or within, as in the case of a vinery.

Doubts have been expressed whether the direct application of radiant heat to plants, may not be likely to be injurious. To these doubts, I have to answer, that all heat which comes from the sun is radiant heat. That the rays of the sun, whether that portion of them which is luminous, or that which is calorific, are essential to the health and existence of vegetables. Those plants which are natives of warmer climates than our own, are exposed to more sunshine, both in regard to its duration and its intensity, than they can possibly be when transferred to our climate. In warm climates, plants receive the radiant heat of the sun directly, and the medium in which they grow is raised in its temperature by radiant heat from the same source. Now, in our ordinary hot-houses, we have been accustomed to imitate a more southern climate, only in one respect; by heating the air; and the plants have no more sunshine than what our climate can afford. Therefore, it has appeared to me reasonable to suppose, that there can be no disadvantage in attempting still farther to imitate a warmer climate, by supplying radiant heat, and using it to warm the air in a hot-house, as it does the air in a warm climate. If plants be exposed to the direct influence of radiant heat in a warm climate, as is the fact, I cannot see how it is to injure them in a hot-house, pro-

vided it be judiciously applied. The more I consider this subject, the more sanguine do my expectations become, of the benefits which are likely to arise from the use of the patent grate alluded to.

I shall conclude by describing, with the help of a sketch, the method of applying the radiant heat from this grate, which is likely to be the best. I propose to place the grate A, in the middle of the house, the distance from the back wall being one-third of the breadth. The grate is to be entire, but the opening behind it B, is to be divided, so that one-half of the current of heated air shall proceed to the right, and the other to the left. The flues are to be conducted diagonally towards the outer corners of the house, in the direction CD and EF, and then to be carried to the back wall, to the chimneys, at G and H. By means of this direction for the flues, and the radiant heat proceeding from the open fire at A, I am of opinion, that the house will be heated more equally and easily than by any other; and it is evident, that a less extent of flue is employed, than in the common method of heating; and that less fuel, than is necessary for common furnaces, will be used.



Since the above description of the patent grate was printed, I have seen an invention of Messrs Begbie and Dickson of Edinburgh, by which the regulation of the heat is rendered equally, if not more certain, and every other advantage acquired by the patent grate, gained in a more simple, and perhaps superior manner. Instead of a moveable box below, the grate has a close bottom, and the opening of the chimney is made to move up and down. Thus, as the coals are consumed, the opening may be let down, till a draught of the power wanted is obtained; and when the current of air is too strong, it is checked by raising the opening; which is a much more simple operation, than moving the whole body of fuel. One quarter of a hundred weight of English coal, value 3d., made a powerful fire, and was not completely consumed in sixteen hours. The smoke is entirely consumed; and the quantity of ashes surprisingly small. The great superiority of this invention, consists in its capability of being applied to any grate; whereas the patent apparatus cannot be affixed to an old grate. It is obvious, that for a hot-house, a very simple form may be given to the fire-place, so as to obviate the expence of the front usually put upon a chamber grate.

XXV.

On the Increase and Application of Manure.

By Mr Archibald Gorrie, Gardener at Rait.

In a Letter to Mr Neill, Secretary.

(*Read 14th December* 1814.)

Sir,

The importance of dung as a restorative for decayed land, and for promoting vegetation, is generally allowed. The high price which it brings at great towns, and the distance to which it is often driven by farmers, are proofs both of its scarcity and utility. A farmer is unwilling to part with any straw which may have grown on his farm, as he considers its loss as so much taken from his dunghil; and for what he can add to his stock of dung over the produce of his farm, he anticipates a return from his future crops.

The gardener works a deeper soil than that wrought by the farmer, and consequently requires a greater quantity of dung to the same extent of surface. Many of the crops which he raises, likewise require a much richer soil than is necessary for the production of farm crops.

Every method which ingenuity could devise, has been resorted to for augmenting the stock of manure, and many useful directions have been written on the subject, particularly in agricultural publications. But as the means to which the farmer and the gardener can have recourse for increasing manure are often different, and the crops which they raise require different methods of applying that manure, I take the liberty of offering a few remarks on the means which almost every gardener may have, more or less, in his power for increasing an article, without which, very limited success would often attend his labours.

It seems to be an invariable law in nature, that decayed vegetables restore to the soil in some shape or other, (according to the process of decay,) those nutritive qualities so essential to the growth of other vegetables; by the process of fermentation and decomposition, they are ultimately resolved into a black earth-like substance, which is generally termed Vegetable Mould; and the soil is more or less of this blackish colour, according to the quantity of this mould which it contains.

Vegetable mould contains much soluble matter, which constitutes the food of plants, and which is readily absorbed by their roots. This mould, so much esteemed by the florist, will not of itself form a manure. The vegetables, while in a state of fermentation, had lost many of their enriching qualities, which escaped either by evaporation or solution. It will, however, form an excellent ingredient in a compost, where an increase of dung is wanted; but before I attempt to describe how the mould of decayed vegetables may be converted into manure, it may be proper to state, that a much larger quantity of dung may be obtained from those weeds and vegetables which are the refuse of the garden, by digging them into the ground when fresh, or as soon as the heap of vegetables may have undergone a very slight fermentation.

It may not indeed be at all times convenient for the gardener to dig ground when he may happen to have vegetables in that state: And where an accumulation of dung is wanted, it will be advisable to have a pit sunk in the compost yard, about four feet deep, and of proper dimensions, to contain the refuse vegetables that may be found in the garden at one time. About six inches of vegetable mould, or the earth that has been formerly used for raising melons or cucumbers, or a mixture of all these, should be laid all over the bottom of the pit. The refuse vegetables,

weeds, &c. should then be laid on with a prong in the same manner as a hot-bed is made up, by shaking the vegetables, and mixing the different sorts loosely, so as all the parts of the bed may ferment or heat at one time. These vegetables should be laid from three to four feet deep, and covered over with another six inches of the same mould as was laid in the bottom. Then allow the mass to ferment until it falls down to within eighteen inches of the bottom of the pit, when it may be taken out and used, or another fresh layer of weeds may be laid over it, and covered as above.

The gaseous matter which escapes during the fermentation of dung, or vegetables, is highly conducive to the growth of plants, as may easily appear from the rank verdure near the site of dunghils, though entirely without the reach of receiving any nourishment from the juices of the dung. During the fermentation and putrefaction of vegetables, a stronger fetid gas escapes, than from farm-yard-dung; and from the abundance of sap in the vessels of green plants, a great proportion of rich juice escapes by solution. This juice will fall down and be absorbed by the mould in the bottom of the pit, which mould should be laid in as dry as possible. The gaseous matter which would otherwise escape in vapour, will be imbibed by the incumbent stratum of mould, which ought to be clapped smooth with the back of a

spade. This forms an excellent dung for apricot, raspberry, currant, and gooseberry borders.

Water is the only vehicle whereby nourishment is conveyed to the roots of plants, and the soils containing most animal or vegetable matter, soluble in water, are always the most fertile.

The sediment deposited by water in ponds, mill-dams, &c., is generally highly absorbent and retentive. The luxuriant crops which grow on the alluvial soils by the banks of winding rivers, and on carse lands in general, point out its fertile qualities. This sediment, however, will be more or less retentive or fertile, according to the sandy nature or the richness of the soil through which the stream passes that supplies the pond with water.

Should the sediment consist of two-thirds of its volume of fine earthy matter, and one-third of siliceous sand, as this sand would render the mass less retentive, and as it contains but a very inferior proportion of vegetative nourishment, it may be necessary to divide it from that part of the sediment which is to be converted into manure.

Supposing the sediment to be about a foot deep, and containing one-third of its volume of sand, mixed with the finer parts in different strata, as deposited by the water occasioned by rains and successive overflowings of the stream; this sand may be divided from the finer parts of the

sediment, by filling the pond about three feet above the sediment, with water, and then agitating the whole, either by riding some horses abreast through the pond, or passing a harrow through the sediment, until the whole is fairly afloat. The sand will soon sink to the bottom, and the finer earth will fall gradually over it. It will be necessary to allow the whole to subside entirely before running off the water, when it will be more firm, and will be found about eight inches deep over four inches of siliceous sand. The fine earthy matter should be carefully taken off, and laid up in heaps by the side of the pond to dry. The sand, which probably may contain some calcareous matter, may be spread on a stiff soil, and the pond cleared out for the reception of more sediment.

Cattles urine, and the water which exudes from dunghils, holds much vegetable nutriment in a state of solution; but is too strong to be applied singly to the roots of plants, if we except some sorts of fruit-trees, gooseberries and currants, but even to these, it should be applied in winter only; if used in summer, in a liquid state, it should be diluted with twice its quantity of soft water. As this is an article of more importance than is generally imagined, it would be economical to have the site of the dunghil hollow in the middle, and a drain running from the lowest part of it to

a pond, the surface of which, should be no higher than the mouth of the drain.

The sediment found in the bottom of ponds, divested of its siliceous parts, and thoroughly dried and mixed with any proportion of vegetable mould, by being immersed in the dunghil-pond, and allowed to continue there for a month or six weeks, during which time, the compost will absorb the rich juices of the dunghil-water; will, upon being taken out of the pond, and dried in the sun, be found to have increased both in volume and weight. This manure may be applied with safety to almost any sort of garden crop, and at any period of the season. I have found a compost of this sort, saturated with the water which came from a dunghil, which was composed of cattle and sheep dung, form an excellent dressing for a vine border.

All animal dungs, I would prefer using as simples, and for the most part without allowing them to undergo any fermentation, where it can be avoided; nor do I think that animal dung of any sort should enter into a compost with earth for increasing manure, excepting with moss or peat*, which is chiefly composed of decayed vegetables in a state of partial decomposition, containing in a latent state, those fertilizing substances which are to be found in dung, and re-

* As recommended by Lord Meadowbank.

quiring only a small proportion of dung and lime to promote a certain degree of fermentation to bring those substances into action. This will be found an excellent manure for strong soils, and well adapted to raise crops of celery, carrots, turnips, potatoes, and many other kitchen crops; for turnips, celery, and potatoes, it will be best to lay it in the drills, but if used for cauliflowers, carrots, &c., it may be as well to work it into the ground the preceding autumn or winter.

I shall here take the liberty of mentioning a method of applying dung to onion ground, where the soil was a light sandy loam, and where the maggot usually destroyed the best half of the crop. In the end of October, I dug over the ground, leaving as much surface exposed as possible, by what is called *winter digging*. It lay in that state until the end of December, by which time it generally happened to be exposed to a storm of frost. On a frosty day, about the beginning of January, I wheeled on a top-dressing of cow-dung, and spread it all over the surface. I let this lie to have its juices washed into the soil before the time of sowing; at which time, I raked off all the dung that would come with the rake, which operation smoothed the surface of the ground. Then, *without digging*, I lined off the alleys, sowed the seed, trode them in, covered with earth from the alleys, and raked the beds.

From this mode of treatment, I always had excellent crops of onions. I have recommended it to many who work similar soils, and they have found it attended with success. This method gives a sort of consistence to old soft soils, such as are often to be met with in old gardens on gravelly or sandy bottoms; and the onions generally form their bulbs above the surface, which I take to be their natural position, and where they are less liable to the attacks of the maggot, than when they form their bulbs under the surface, which is principally occasioned by dunging and digging light soils for onions in the spring.

As I am doubtful that the length of this paper much exceeds its merit, I shall only add, that, in the application of manures, the nature of the manure, and the soil to which it is to be applied, should be well attended to.

If the soil be porous and not retentive, this should be counteracted as much as possible by the application of the most tenacious and retentive sorts of manures, such as the sediment of ponds, treated as above recommended, marl where it can be had, cow-dung, &c.

Where the soil is of an opposite nature, and retains moisture to excess, such manures as tend to open and pulverise it should be applied; such as lime, horse dung, (but dung and lime should never enter into a compost, unless for the purpose of fermenting a mass,) scourings of roads, fer-

mented moss, powdered bones, &c., and above all, the soil should be well exposed to the winter frost, that, when the water contained in the soil is congealed, by occupying a larger space than before, it may break asunder the soil, and make it incorporate more fully with the manure.

Your laying this before the Society, will oblige, Sir, yours, &c.

RAIT GARDEN,
31st August 1814.

XXVI.

An account of a method of growing Celery, practised by John Walker, Gardener to Thomas Walker, Esq. Langford.

In a Letter to Mr NEILL, Secretary,

From GEORGE HENRY WALKER, Esq.

(Read 12th March 1816.)

SIR,

ACCORDING to promise, I now send you a short account of the method of growing celery, practised at Langford, near Manchester.

The *seed* employed, is that of the red celery, of which the sort raised in the neighbourhood of Manchester, is excellent.

The *seed-bed* is formed of fresh dark loamy soil, mixed with old hot-bed dung, half and half. A quantity of fresh soil is generally placed in a box in a hot-bed. The seed is sown for the early crop about the 1st of March, and for the late crop, about the 1st of April.

The *transplanting bed* is formed with old hot-bed dung, very well broken, laid six or seven inches thick, on a piece of ground which has lain some time undisturbed, or has been made hard by compression. The situation should be sunny. The plants are set six inches apart in the dung, without soil, and covered with hand-glasses. They are watered well when planted, and frequently afterwards. By hardening the soil under the dung in which the plants are set, the root is formed into a brush of fibres; and by thus preventing the pushing of a tap-root, the plant never runs to seed before the following spring.

The *trenches* are made at four feet distance, eighteen inches wide, twelve deep, and filled nine inches with a compost of fresh strong soil, and well rotted dung; three-fourths dung, and one-fourth soil. Old hot-bed dung is the best. The plants should be taken up with as much dung as will conveniently adhere to the roots, and the side shoots are removed from the stems; they are then set with the hand at nine or ten inches apart, in the centre of each trench; it is necessary to water well until they are ready to be earthed up, but not afterwards.

The *earthing up* is thus performed. Having again removed the lateral shoots, the leaves of each plant being held together with one hand,—the soil, well pulverized, is drawn round with the other, taking care not to earth up too high at once,

nor too close. The heart should always be left quite free. This may be repeated about once a fortnight, until the plants are ready for use.

In preparing *plants for seed*, it is to be observed, that the best are the most solid, of the reddest colour, and the smallest size. When taken out of the transplanting bed, the lateral shoots being removed, they should be set in a dry warm situation, where the seed will ripen well.

By this method, celery may be grown to 10 lb. weight, and averaging 6 lb. each. A head of celery was dug up last year on the 4th of October, at Longford, which weighed 9 lb., when washed, with the roots and leaves still attached to it, and measured 4 feet 6 inches in height. It was perfectly solid, crisp and firm, and remarkably well flavoured.

If you will communicate this to the Caledonian Horticultural Society, should you consider it deserving enough, it will oblige, Sir, &c.

EDINBURGH,
15th February 1816.

XXVII.

On forming Hot-Beds with the Refuse Matter thrown off in dressing Flax.

By Mr PETER BARNET, Gardener at Kennet,

In a Letter to Mr NEILL, Secretary.

(Read 12th March 1816.)

SIR,

THE heat produced during the process of the fermentation of vegetables, or vegetable-matter, has hitherto been the chief means employed for raising a bottom heat requisite to grow pine-apples, melons, and early cucumbers, in this climate.

If vegetables be fermented in a green state, the heat produced is violent and transient; but the more firm and dry the texture of the substances submitted to that process, the less violent and longer continued is the heat produced. Hence,

oak-bark, after the tanning principle has been extracted, and dried leaves of trees, have been found the most proper articles for pine-stoves and melon-pits, where linings could not be applied.

Horse-dung and litter, are for the most part employed in forming hot-beds for melons and cucumbers. The dung is seldom obtained without a grudge from the overseer of the farm, who believes that his dung could be laid out to much better account on his fallow or potato-ground. The gardener, too, although he says little, is conscious of the loss which the dung sustains, by evaporation and solution, during the protracted fermentation which must be necessarily kept up by linings to ensure a crop of melons.

As, therefore, it will be allowed on all hands, that dung is too valuable a commodity to be wasted, and as tanners bark is now much risen in price, in consequence of its being in many places applied in compost for the increase of manure, if an article, which has hitherto been reckoned useless, may be employed successfully in forcing, it will be a matter of some importance, at least to those whose local situation may enable them to avail themselves of its use.

The article I allude to, is provincially called *rolling shows*, and consists of the pith of flax which escapes when the flax is rolled, before scutching. This substance, I have found, will maintain a regular heat for many months succes-

sively, with little or no trouble. I satisfied myself in this particular, by frequent inspection, at a neighbouring lint-mill, of heaps of *rolling shows*, which had been carelessly thrown together, and left remaining in one place for fourteen months. During that time, the heat would have raised Fahrenheit's thermometer to 64° near the bottom. Potatoes were growing on the top early in the spring, without earth; but the miller lost his crop by attempting to heap the *shows* round the stems in the manner of earthing up: this raised so violent a heat, as to destroy his crop in a night's time. I have given the *shows* a trial under glass. The fermentation commenced almost immediately, and a regular heat was maintained for a long time: and from the length of time which *lint-shows* have been observed by me in a state of fermentation, before they were totally decomposed, I think I may safely conclude, that their heating effect will be more lasting than that of most other substances which have hitherto been applied to purposes of forcing. I may add, that the *shows*, when decomposed by fermentation, have been found to prove excellent manure.

LOGIEALMOND,
14th November 1815.

XXVIII.

Of the Scale on Fruit-Trees.

By Mr THOMAS THOMSON, at Smyllum Park.

In a Letter to Mr DICKSON, Secretary.

(Read 11th June 1816.)

SIR,

AFTER the many excellent communications to the Caledonian Horticultural Society, on the nature and method of destroying insects, that infest fruit-trees, it may appear presumptuous in me to say any thing further on the subject. But not having seen any one that takes notice of a scale, that is very baneful to fruit-trees, I trust that the few following observations will not be thought altogether unworthy of your notice.

In order to prevent doubt as to the nature of this scale, I send you two specimens taken from the apple and apricot, which are marked accordingly. My attention has been principally directed to the scale upon the apricot. But I am of opinion, that the insects that are produced on the different kinds of fruit-trees, are much the same, although they often differ in colour. I am inclined to think that their colour is more owing to the food of which they partake, than from any specific difference in the animal.

The first appearance of the scale, is generally in the month of August. It appears like a small drop from a wax candle, being quite smooth and a little transparent. It does not assume the indented appearance, as in the specimens, for some little time. It seems to cover and protect the eggs of an insect during the winter months. It gradually increases in size, till within a few weeks of the tree coming into blossom; and from its first appearance, till the eggs become animated, (which is generally two or three weeks before the tree comes into flower), it is full of a greenish matter. No sooner are the eggs come to life, than it begins to have a dry appearance, and is easily separated from the bark. By now examining the inside of the drop, it appears full of small white specks like grains of meal, in motion; these in a few days assume the natural form of caterpillars, being so far matured, as to be able to

raise the scale from the bark; in a fine day, these can be seen looking out all around the scale. By the time that the tree is in full blossom, they are capable of leaving the scale; this they do generally in a fine mild day, and they immediately take possession of the flowers, preying upon the stamina and stile of the flowers, and causing numbers of them to fall off without setting. By the time the flowers naturally decay, they are so far strengthened, as to live upon coarser food; for they then attack the leaves, and often the points of the young shoots. This checks the elongation of the shoots, causing them to throw out a great number of laterals, and not only renders the tree unsightly, but is greatly against its making bearing wood for the next season. After having committed so much injury, they at last involve themselves in leaves, where they soon become chrysalids. They remain in that state for a short time, and are then transformed into butterflies or moths.

That the scale is produced by moths, I have not the smallest doubt; but in what manner, and at what period, I am sorry to say that I have not been able to discover. When I first observed them, I was inclined to think, that the flies made incisions in the bark; that they deposited their eggs in these; and that a gummy matter exuded from the tree, which formed the scale. But I found, by carefully removing the scale, that there was not the smallest puncture to be seen in the bark.

I am strongly impressed with an opinion, that when the fly lays its eggs, it emits a viscid substance, which protects, and becomes the means of maturing them; for, as I have already observed, a desiccation takes place in the scale, as soon as the eggs come into life.

Those that have suffered by caterpillars, on their apricot-trees, I would advise to examine the trees carefully; for I have not the smallest doubt, that they will find a number of the scales both on the bark, and likewise on the walls, (for I have found many of them on both brick and stone walls); and by destroying the scales, the trees will be greatly improved in a short time, both in regard to foliage and bearing wood; so that they will be better prepared to produce a good crop of fruit the following season, and the fruit will be much fairer.

It may be expected that I should say something on the method of destroying the scale. To destroy them upon the apricot-tree, I have always found the month of February the best time, and especially after rain, while the bark remained wet; as the bark at that time appears darker than usual, and the scale being of a pale colour, is more easily discernible. If the person that is employed to nail the trees to the wall in the spring, be careful to examine them as he goes along, he will be able to discover most of them; and nothing more is required, than to re-

move the scale from the spot where it is fixed with the point of his nail.

If what I have said above, should be the means of inducing others to investigate the subject, so as to throw more light on it, I shall think myself happy in being of some small benefit to the Society. I am, &c.

SMYLLUM PARK,
April 20. 1816.

P. S.—In looking over my notes on gardening, I find, that as early as the year 1788, I scraped off the old bark of apple-trees in the garden at Tynningham, belonging to the Earl of Haddington, and that I had the first hint from a gentleman, who informed me, that scraping off the bark was a practice in America, in order completely to rid the trees of moss and other parasitical plants that annoyed them. If you think a few remarks upon the subject will be acceptable to the Society, I shall send them.

XXIX.

Account of the Eve Apple, a variety much cultivated in Clydesdale.

By Mr Adam Smith at Paisley.

In a Letter to Mr Neill, Secretary.

(Read 14th December 1813.)

Sir,

I send you a drawing of the *Eve Apple*, with the leaf and blossom. The Eve Apple is a native of Ireland. The tree was first introduced into this country about twenty-two years ago, by one John Sinclair, who went to Ireland from this place, and sent a young tree to his old employer Mr Wilson, which stands in full health and beauty to this day. The drawing was taken from an apple taken from one of Mr Love's trees, which are principally grafts

from Mr Wilson's, and, after standing about twenty years, are all in perfect health.

The late Provost Ballantine in Ayr, received two trees of the Eve Apple, the same season, from a gentleman in Ireland. From these two sources, have sprung the great influx of the Eve Apple in the west of Scotland. Almost no other apple is sought for from the nurseries here. I believe the tree is not equalled for a prolific bearer, except by the Keswick Codling; it is more esteemed than the Codling; it is of a better colour, and more agreeable to the taste; and the Eve Apple will keep four months if properly stored after it is pulled, whereas the Codling keeps only two months.

The Eve Apple is ripe in the middle of September; it bears the second year after being grafted, and there are instances of its bearing even the first year.

The tree is acknowledged by connoisseurs to be of a very beautiful growth; it is close and compact, the spurs are all regularly distributed along the branches, from the stock to the extremities; it bears from the heart nearly to the top, and forms sometimes buds upon the young shoots. It stands very erect, and forms a very handsome round head; the young shoots are of a darkish colour, but the old wood approaches near to the ash colour; the bark appears slightly shivered. It flowers rather later than the Hawthorndean; the flower is of a pink colour, and when it is half

open, it is as dark as ruby. I have not seen in this country a tree so rich and beautiful when in blossom; indeed, the flowers are so regular along the branches, that the tree has all the appearance of a garland.

The fruit sometimes attains seven ounces in weight, when in perfection.

The quality of this apple, is very good: it may either be used at table for eating, or in the kitchen for baking. The tree may be very easily propagated either by cuttings or layers, as well as by grafting.

For this short communication, I am chiefly indebted to Archibald Duncan, Mr Love's gardener at Paisley. I am, &c.

PAISLEY,
10th December 1813.

XXX.

Communication to Dr Duncan senior, *respecting the Brown Apple of Burntisland. Dated October 6.* 1815.

(Read 28th December 1815.*)*

Dr Duncan is requested to accept of a sample of the Brown Apple of Burntisland. They are selected not on account of their beauty, of which, in general, they have little to boast; but to shew the different appearances of the fruit, which are sometimes very various. Mr Porterfield, gardener at St Bernard's, in his account of this apple sent last year to the Society, was in a mistake, in saying, that it was originally brought into this country from the south of France, by the late Sir William George Fairfax; for, it is certain, that it was a favourite apple with Sir William's father-in-law, the late Mr Charters at Burntisland, long before Sir William was acquainted with that place, or with the family of Mr Charters. It is very uncertain

whence it was brought originally, but probably the first place where it was cultivated in this country, was in the garden at Newbigging, near Burntisland, or in the garden at Burntisland which belonged to the late Mr Charters, afterwards to his son-in-law Sir William George Fairfax, and which now belongs to Mr Leven. At least, it is certain, that the fruit has been cultivated there for upwards of fifty years, and probably much longer.

This fruit does not come to perfection, unless the tree be trained to a wall, and then it bears good crops. As to flavour, it is thought superior to any other Scotch apple, and may therefore deserve to be more generally cultivated. It does not, however, answer to be long kept, and if quite ripe, is in greatest perfection when newly plucked, or only a few days after being taken from the tree.

The apple is in general of a brownish colour, and has a small stalk, varying in length, but generally long. On a young tree this season, in Mr Leven's garden, some of the fruit was as fair as the White Codling, and, though smaller, not unlike it in shape or outward appearance, excepting about the stalk.

In Burntisland and its neighbourhood, where the apple is well known, it is called merely "the Brown Apple." For its origin, this apple can be traced to Burntisland or Newbigging, and no

farther; that part of the country, therefore, claims it as its own, and seems to have the best right to give it a name. In short, Pomona seems to have dropt this apple at Burntisland; and as it has been so long kindly fostered in that neighbourhood, there seems no necessity for giving it a name from the south side of the Forth. May she expect some assistance and protection in this case from zealous Horticulturists, anxious for encreasing the varities of our most useful fruits?

Dr Duncan's Answer.

Edinburgh, 7th October 1815.

Dr Duncan *senior* acknowledges his having received an anonymous paper, dated the 6th instant, accompanied with a sample of apples from Burntisland, and takes this method of returning thanks to the donor, as he cannot address him by name. He agrees perfectly with the writer of the paper, that the appellation of the *Brown Apple of Burntisland*, is the most appropriate. He shall transmit the communication to the Secretary of the Caledonian Horticultural Society; and at present, he shall only farther observe, that he agrees in opinion with some other gentlemen, that the *Brown Apple* has been originally produced from the seed at Burntisland.

XXXI.

Further Communications respecting Lactucarium.

By Dr DUNCAN *senior.*

(Read 3d December 1816.*)*

To the Secretary of the Caledonian Horticultural Society.

SIR,

I have already published in the Memoirs of our Society, several short notices respecting the mode of preparing from common Garden Lettuce, a substance I consider as a very valuable medicine, and which I have denominated *Lactucarium* or *Lettuce Opium.* As the preparation of this article, may, in my opinion, become a profitable pursuit for some attentive and intelligent professional gardeners, permit me to request that the following letters respecting it, may also obtain a place in the Memoirs of our Society. I am, &c. (Signed) AND. DUNCAN *sen.*

To Dr DUNCAN *senior*.

Edinburgh, 5th October 1816.

DEAR SIR,

Your zeal in promoting the interests of science, and of that branch of knowledge in particular, which belongs to our profession, induces me to lay before you, the annexed observations, on a new method of collecting the milky juice of the Lactuca sativa, and also of the Papaver somniferum, both in Britain and other countries. I am induced to take this step, because I know, that if you think my method of collection of any use, it cannot be recommended to the public through a better channel than you; and because I know that you have, for some time past, been engaged in a series of trials, for ascertaining more fully the medicinal effects of Lactucarium. In the mean time, I shall be glad to know your opinion with regard to the observations I now send you: And I shall have the honour of communicating to you, whatever else may occur to me on this subject. I am, &c.

JOHN YOUNG.

Observations on the method of obtaining Lactucarium, or Lettuce-Opium, from the Lactuca sativa of Linnæus, the common Garden Lettuce. *By* Mr JOHN YOUNG, *Surgeon in Edinburgh.*

October 1816.

In collecting Lactucarium last year, according to the method recommended by Dr DUNCAN *senior* in the Memoirs of the Caledonian Horticultural Society, I found, that it not only occupied much time, but that I was often disappointed of the substance which I expected to obtain, from its being washed off by rain. It occurred to me, that the milky juice of the lettuce might be immediately collected from the plant in great abundance, by absorbing it on cotton soon after it exudes from the plant, and while it yet continues in a liquid state; and by afterwards inspissating it by moderate heat, communicated from a water or vapour bath.

I accordingly adopted that method this year. I had the ice-lettuce planted in rows; and when the top of the stem was about a foot above the ground, I then cut off about an inch from the top of each plant. The milky juice immediately began to rise above the wounded surface. I cut off the tops of all the plants before I began to collect. But after the portion which had

exuded was removed by the cotton, I found that the milky juice ceased to exude, until I had made another wound. I began to collect, at the end of the border, where I made the first incision, and then cut off a thin cross slice from the stem of each plant, leaving fresh wounds as I went along. These I found covered with milky juice each time when I returned to where I set out. But after going round the plants about five or six times, in the way mentioned, they ceased to give out any more milky juice, at that time. But this process may be repeated two or three times in a day.

In the manner above described, I have collected more of the milky juice in one day, than I did last year in five days, when it was not removed till it had acquired a dry state and black colour. Having mentioned to a friend my mode of collecting the milky juice in its recent state, by means of cotton, he suggested the use of a wet sponge for that purpose. This, I find, answers better than the cotton; the juice being both more completely removed from the plant, and more easily expressed, than from the cotton. The milky juice collected in this way, into a tea-cup, or any similar vessel, soon acquires a dark brown colour, like Opium obtained from the Papaver somniferum, and has all its other sensible qualities. Hence it may justly be dis-

tinguished, by the title of Lettuce-Opium, although, perhaps, less confusion will arise, from employing the name which Dr Duncan has adopted, that of Lactucarium.

From what I have observed respecting this method of collecting the milky juice from the Lactuca sativa, it is my opinion that in the same manner, Opium might be procured in this country from the Papaver somniferum, equal, if not superior, to any foreign opium. Dr James Howison, who was for some time employed by the Honourable East India Company to superintend the preparation of opium in Bengal, has published an essay on that subject in the First Volume of the Memoirs of the Caledonian Horticultural Society, page 368 *, which contains many important observations respecting the preparation of opium in Britain. But the method of collecting the milky juice from the plant by means of cotton or a sponge, possesses many advantages which cannot be obtained by the flask which he proposes, or by the knife and cup of the Hindoos: For by their method of collection, a considerable quantity of the milky juice, exuding from the head of the poppy, must be lost. But by preparing opium in Britain, a still

* A Prize Medal was awarded to Dr Howison by the Society, for this communication.

greater advantage would accrue. It would be obtained in a perfectly pure state, which is by no means the case with the opium which is brought to us from abroad.

By Mr YOUNG's process, I have no doubt that Lactucarium may be obtained, with much more ease, and to a greater extent, than by the method which I formerly communicated to the public. But in whatever way the Lactucarium or Lettuce-opium may be prepared, I am convinced, both from my own experience, and from the observations of several of my friends, that from the common lettuce cultivated in our own gardens, we may obtain an useful sedative medicine for allaying pain, and procuring sleep, in those constitutions with which opium, the most useful of all medicines yet discovered, cannot be employed without producing very disagreeable consequences. In proof of this, I shall only subjoin the following letter from my intelligent friend Dr JAMES ANDERSON, an eminent accoucheur in Edinburgh, who has very extensive practice in the diseases of Women and Children, and who has often employed Lactucarium, particularly in puerperal cases.

To Dr Duncan senior.

Edinburgh, 28th October 1816.

My Dear Sir,

In consequence of a conversation with you some years ago, I was led to pay particular attention to the effects of lactucarium in certain cases.

I have seldom been disappointed, when it was exhibited in a proper doze, to promote rest, and allay irritability. I have observed that when the doze had not been sufficient to procure sleep, my patients still obtained from it, comparatively easy nights, being freed from hot skin, inclination to toss about, and similar uneasiness.

For these four years I have used it with success for such patients as disagree with opium. In no case have I observed consequent nausea, costiveness, or irritation of the skin produced by it.

It is gratifying to observe with how much thankfulness it is taken by such valetudinarians as are excluded from the use of opium from its distressing effects upon them. Two Ladies of my acquaintance, the one subject to spasms in the stomach, and the other to frequent attacks

of irregular gout, have for these three years reared lettuce plants, and made a tincture for themselves, which they have employed in their own cases, with great relief: And from what I have seen, I have no doubt, that when lactucarium becomes more an object of attention with medical practitioners, it will be generally used where opium cannot be administered. I am, &c.

JAMES ANDERSON.

XXXII.

On the Effects of Anointing the Stems and Branches of Fruit-Trees with Oil, and on the Means of Destroying Insects.

By Sir G. S. Mackenzie, Bart.

In a Letter to the Secretary.

(Read 3d December 1816.)

The trees in my garden, having been much infested with insects in the year 1815, I became anxious to devise means to prevent their increase. I recollected to have seen an apple-tree in the Duke of Buccleuch's garden at Dalkeith, which had been almost destroyed, by what is called the *Scaly insect**; but which had recovered on the

* The *scale* has, I understand, been lately discovered to be the nidus, in which the eggs of some winged insect are deposited. Larvæ have been observed to issue from it, but they have not yet been found in the pupa state.

application of a mixture of oil, sulphur, and soot. It is well known, that oil is fatal to insects, and to this part of the mixture, I attributed the recovery of the tree. I conceived that oil, applied to the stems and branches of trees, might act in two ways; it might destroy the eggs and pupæ of insects already deposited; and it might prevent the attack of insects in future. It occurred to me also, that oil, by softening hard and diseased portions of the bark, might be, in these respects, beneficial to the health and growth of the tree, and enable the vegetative power to throw off such portions by a natural process, which might be preferable to the more violent proceeding of scraping, while the bark is constricted.

With these views, I directed my gardener to anoint a considerable number of trees of different kinds. Not being aware of any injury which was likely to arise from allowing the oil to touch the buds, he zealously rubbed every recess into which it was possible for eggs to be deposited; and this has been the means of my discovering, more extensively than I should otherwise have done, the effects of oil, both in regard to benefit and injury; though those of the last kind have put me to some little inconvenience. I shall now detail these effects.

Apple-Trees. In every case where the buds were not touched, every beneficial effect has followed the application of oil to the stems and branches. Fruit-buds, if touched, are destroyed; and also, if far advanced, the leaf-buds. But new buds of both kinds, are afterwards produced in great numbers; and I remarked on two young trees with long bare stems, that buds burst forth on the stems, where none had appeared before. This is easily accounted for. The sap not being able to find the usual outlet in the expansion of the buds formed the previous year, acted so as to produce new buds and branches, in the same manner as it does when a tree is cut over. There are now numerous fruit-buds on trees which had but few, and those few were completely destroyed.

Pear-Trees. These, though the more advanced fruit-buds suffered, have been less injuriously affected than apple-trees. Their growth has been unusually vigorous; and great numbers of new buds have been formed, covering branches, which before were naked. This I remarked particularly on a Jargonelle.

Plum-Trees did not appear to suffer in any respect, but shot out blossoms and wood vigorous-

Peach-Trees. One tree, an old one, appeared to have been totally destroyed. But on examining it carefully, I observed some buds which appeared alive. I cut all the branches down to these buds, which have produced astonishingly fine shoots. A young tree, which for a year or two had made so little progress, and appeared so unhealthy, that it had been condemned, has shot forth in a surprising manner, and has become a very handsome tree. I was not, at first, particular in my examination of this tree, as, from its former appearance, I was not anxious about it. It is probable, however, that the oil had not reached the best buds.

Apricot-Trees were so much injured, that the shoots were feeble, and the trees ultimately perished. I do not yet know what the effect will be when the buds shall be carefully avoided when the oil is applied.

Cherry-Trees were seriously injured. When I speak of injury, I mean, that in those cases where the buds were not spared, new ones did not push forth, and the general health and vigour of the tree seemed impaired.

Vines, treated in this manner, without sparing the buds, die down to the root, from which strong

shoots are afterwards sent up. When the buds are not touched, they grow vigorously. But, on the whole, as the annual exfoliation of the bark admits of its being easily removed, I am not inclined to advise the application of oil to vines.

Gooseberry and *Currant Bushes* did not appear to derive any benefit, but seemed to me rather injured by the oil.

Those peach-trees which were not oiled, were as usual infested with aphides, while no insect of any kind was to be seen on those which had been oiled.

The apple aphis (A. lanigera) has been entirely extirpated from one garden, by means of oil applied to every part where it appeared; and I doubt not of its being soon destroyed in every district of the kingdom which it has reached, if the same means be used.

While the experiments leading to the results now detailed were in progress, I was informed, that a Lady, who is fond of horticulture, had cured several trees of canker, by first removing the diseased parts, and then covering the wound with a piece of rag, spread with hog's lard. We may infer, that oil will have the same effect.

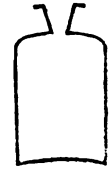
I noticed very early in the progress of my ex-

periments, that on the stems and branches which had been oiled, parts diseased, and where branches had been removed, became of a different hue from the rest of the bark; an exfoliation appeared to commence; and in autumn, new bark was seen to have been produced, and to have displaced that which was dead and diseased, so that it could be easily removed.

From what has been related, I am satisfied, that in many cases, trees will derive much benefit from the application of oil, care being taken not to touch the buds, especially if they have begun to swell,

Besides the enemies to fruit, which lurk in the bark, we have yet to contend with those which deposit their eggs on the leaves and blossoms. From wall and espalier-trees, the larvæ may be removed with little trouble; but when an attempt is made to clear standards, the trouble and time required, cannot be expected to be repaid. Gardeners are in the habit of suspending on wall-trees, bottles with a little sugar, or honey, and water, to destroy the insects which attack ripening fruit. If they will hang up the bottles early in spring, both on wall-trees and standards, and continue to use them during the whole season, they will be surprised at the destruction of insect

enemies which will ensue. Thousands of insects, some in search of food, and most of them pregnant, and some moving about for the purpose of depositing their eggs, will be tempted to their destruction; and few, comparatively, will be left to do mischief in the autumn. The bottles I have used for this purpose, are of the shape delineated on the margin. A winged insect, which gets in, though it should not touch the liquid, cannot return on account of the neck of the bottle being narrow, and depressed a little under the shoulders.



There is an enemy, however, which does more mischief than perhaps all the others put together, that cannot be destroyed by these means. As this enemy commits its depredations only during the night, it is not probably generally known. Pear-trees and vines, seem to be most liable to the attacks of this lurking enemy; but it has been detected on many other kinds of trees. The destruction so often observed on grafts, is the result of this creature being permitted to multiply. It is, I believe, the *Curculio vastator*, a weevil, which retires during the day amongst little clods of earth, from which, owing to its colour, it is scarcely distinguishable, as it never moves when touched. When mischief is observed to have been done, and the enemy is not perceived, by looking

amongst the earth at the foot of the tree, these weevils will be found. They can only be destroyed by searching for them, and killing each individual when discovered. The method which I have found the simplest and most effectual, is to tread the earth round the stem after it is dark, and to place bits of slates, tiles, or small stones round it. In the morning, the weevils retreat under them, and may be picked up. Cracks in the bark, the separations of branches, holes in the wall, and every cranny into which it is possible for the weevils to enter, should be examined. Perhaps wrapping round the stem, a little tow soaked with some adhesive composition, such as the basilicon ointment of apothecaries, may have the effect of arresting these insects, when they attempt to ascend the stems of the trees.

The *Curculio abietis* was detected once on a vine. This is a considerably larger weevil than the *vastator*, and is one of those with a lengthened snout. If gardeners will take the trouble, occasionally, to look over their trees and bushes in the night-time, many nocturnal depredators, and their haunts, may be discovered, which are at present little suspected. It would be of importance, when any new enemy is discovered, that it should be sent to you, with an account of the manner in which it inflicts injury, of the particular part of the plant which it attacks, and of such

other circumstances as may be known concerning it.

A member of this Society, Mr John Linning, has informed me, that he has found a little oil put on the stems of Carnations, very effectual in protecting them from the attacks of earwigs.

As this defence is always at hand, and may be easily made use of, horticulturists and florists will, I hope, repeat and extend the experiments which have been made.

The oil which I used was common fish-oil. Whale-oil of the coarsest kind will answer equally well; and indeed any greasy substance. No more should be put on than will just produce a shining surface.

DISCOURSES

READ AT THE

ANNUAL ELECTION MEETINGS

OF THE

CALEDONIAN HORTICULTURAL SOCIETY,

IN THE HALL OF THE ROYAL COLLEGE OF PHYSICIANS,
EDINBURGH,

December 4. 1815; *&* *December* 3. 1816.

BY

ANDREW DUNCAN, *sen.* M. D. & P.

DISCOURSE, &c.

Delivered on the 4th December 1815.

GENTLEMEN,

BY order of the Council of this Society, I have now to inform you, that they have awarded your annual Gold Medal for the most interesting communication transmitted to them since the last Election Meeting, to a very meritorious fellow member, Sir GEORGE MACKENZIE. In his absence, I now deliver it to our Secretary, to be transmitted to him. It will, I am persuaded, afford to all of you, no small degree of satisfaction, that this honorary testimony of the Society's approbation, has, for the present year, been adjudged to one, to whom our Institution lies under the greatest obligations. To you, Gentlemen, who are well acquainted with his character, I need not observe, that he has been, for several years, a zealous patron of almost every respectable literary or philosophical institution which adorns this City;—a City whose highest pride is her proficiency in science.

Among others, this Society has had no inconsiderable share of his attention. He has not only supported and cherished this institution even from its cradle, by his countenance and advice, but he has also been a most active promoter of the improvement of Caledonian Horticulture, in the line too in which it can be most effectually improved, by judicious, attentive, and candid experiment. Of this fact, his paper, to which our Prize Medal for the present year has been awarded, giving a description of an Economical Hot-House, affords, in my opinion, incontestible evidence. It has long been the boast of Scotland, that by the skill of her professional gardeners, aided by the artificial heat which may be derived from coal, and the proper protection which glass may afford, she can rival the most genial climes on the face of the globe, in the production of some of the finest fruits which the Author of our Nature has bestowed as a blessing on the human race. This is particularly the case with respect to the Grape. And, to many of you, well acquainted with the foreign grapes, which are almost the spontaneous product of more favoured spots in Europe, an ample proof of this was afforded at our last Annual Festival. There we were presented with some of the best varieties of Grapes, the Frontiniac, the Muscat, and the Lombardy, in the greatest perfection, and all of them the growth of vineries within a few miles of Edinburgh.

That, by the skill of our Gardeners, aided by coal and glass, Scotland can produce Grapes not inferior to the most fertile countries on the face of the earth, I am in some degree enabled to assert, on my own recollection. I formerly mentioned in this Society, that it had been my lot to visit different quarters of the world. And, among other places, I was once at the farm of Constantia, near the Cape of Good Hope, at the season when their grapes were in the greatest perfection. I had not only an opportunity of tasting genuine Constantia wine, from the tun, but also of partaking liberally of the finest grapes from which a fresh supply of wine was soon to be obtained. Excellent as these grapes were, they did not, to the best of my recollection, excel those Constantia Grapes which are the growth of the environs of Edinburgh *. But, notwithstanding the progress already made in horticulture, much yet remains to be done. Though, by the aid of artificial heat, and proper protection, the coldness and the variable nature of our climate,

* At a quarterly meeting of the Society on the 10th of June 1817, a bunch of the Black Hamburgh Grape was exhibited, which was produced in the garden of General WEMYSS, in Fife-shire, very high flavoured, and weighing above four pounds, the berries being, at the same time, peculiarly beautiful and large. In June, such grapes could not be obtained at any price either in France, Spain, or Italy.

may be effectually overcome, this cannot be done but at a considerable expence. It is, therefore, an object of great importance to invent a house, by means of which, the industrious professional gardener, may be able to supply the market with the finest fruits at a moderate rate.

With a view to the accomplishment of this desirable object, Sir GEORGE MACKENZIE has invented and constructed in his own Garden, an Economical Hot-House; and he has enriched your Memoirs with a description of it, illustrated by engravings. What he has here presented to you, is not to be considered as a mere plausible untried invention. Before communicating his plan to the public, he has patiently waited the test of experiment. In his own garden, a Hot-house constructed upon the plan described, has been found to answer the most sanguine expectations. And there is now good reason to hope, that our Market Gardeners may be able to supply Edinburgh with some of the most delicious, and at the same time, the most innocent luxuries of the table, at a very moderate expence.

It is indeed true, that Sir GEORGE's plan does not combat expence from every quarter. The high duty which the Legislature have thought it advisable to put upon glass, is a drawback on our vineries, which still remains to be overcome; and till a proper substitute for that too highly taxed article be invented, grapes will never perhaps be raised with advantage in Britain to supply

us with Grape-Wine from our own gardens. All the attempts, however, hitherto made, to find a cheap substitute for glass, have proved ineffectual. There have, indeed, been several competitors for our premium offered on that subject; and, it is with pleasure I observe, that some of the articles proposed, are not without considerable merit. I may particularly mention, an improved species of package paper, into the composition of which, there enters an animal substance, the refuse of hides, which formerly was entirely consigned by the curriers to the dunghil. By a mixture of this, with the coarsest rags, or similar vegetable matter, a package paper is now manufactured by a respectable Member of our Society, which possesses peculiar advantages, in resisting both fire and water. But, in the state in which it comes from him, it has been determined, by different fair trials, that it is incapable of resisting all the vicissitudes of our climate; and a cheap substitute for glass still remains to be discovered. It is, however, satisfactory to think, that some progress has been made; and I am not without hopes, that by the discovery of some proper varnish applied to the Leather Paper, as it has been called, it may afford a very useful substitute for glass, to those with whom economy is absolutely necessary, that their industry may receive a due remuneration.

In this way, therefore, I hope our Society shall soon do more good. But whether a cheap sub-

stitute for glass shall ever be discovered or not, I have no doubt, that our premiums will be beneficial to horticulture in many respects. And it gives me no small satisfaction to be able to congratulate you on the prosperity of this Institution. Of that, you have sufficient evidence, from the number of respectable names which have been added to our list during the course of the present year*. All the Ordinary Members, by adding to our annual funds, encrease our capability of doing good. And from some of our Honorary Members, from whom no pecuniary aid is expected, we have derived very great advantages. I may particularly mention Sir ALEXANDER CRICHTON, Physician at the Court of Petersburgh. To him, we are indebted for the seed of a new Turnip, from the wilds of Siberia, which, in the coldest parts of the Russian Empire, is found to be a most useful article for domestic purposes.

While, however, the year 1815, has in many respects been a prosperous one for our Society, we have also great calamities to deplore. We have been deprived, by the hand of death, of several of our most respectable Members. Two of them were my particular and much esteemed friends, and you will, I hope, forgive me, when I bestow upon their memory, a few sentences of eulogium.

* Forty-five Ordinary Members.

JAMES, Lord TORPHICHEN, a Patriot in the proper sense of the word, and a zealous Amateur of Horticulture, was one of the earliest Patrons of this Society. At the request of those who first formed the institution, he cheerfully accepted of the rank of an Honorary Member; and for some years, his name stood upon our Honorary list. But, that he might be more useful to us, and that he might be regularly called upon to contribute to our funds, his name was, at his own particular request, transferred to the Ordinary list. The aid, however, he afforded us by his annual contribution, was a small portion of the services for which our Society and Horticulture in Scotland are indebted to him. He not only accepted the office of being one of our Vice-Presidents, but discharged the duties of that office, with fidelity and zeal. In his own garden, formed entirely under his own eye, he has left behind him, an experiment, for which, I have no doubt, he will receive the warmest thanks of posterity: And while the Wooden Walls of Britain, enable our sea-girt Island to bid defiance to the world, and, to use the words of the eloquent Lord MANSFIELD, render a spot hardly visible upon the face of the Globe, the chief seat both of Empire and of Science,—the Wooden Walls of a Scottish Garden, may afford to the rising generation, an example worthy of imitation. The Father of the late Lord TORPHICHEN, and the then Duke of ATHOLE, were two of the first

who introduced extensively into Scotland, the culture of the Larch-Tree. From these Larches, growing in his own plantations, the walls of Lord TORPHICHEN's garden were almost entirely formed. Hitherto, from this experiment, there is every prospect of success; and if it shall succeed to the extent, which, there is good reason to hope, it will point out, to the rising generation, a cheap, and an expeditious mode of enclosing, and still more of subdividing gardens, not only for defence, but also for training many different species of our most valuable fruit-trees.

The other esteemed friend, whose death I have also many reasons to deplore, and which has deprived our Society of one of its most useful Honorary Members, was Dr JOHN COCKLEY LETTSOM of London. Without entering into farther particulars, permit me only to observe, that to him, Britain is principally indebted for transferring the Crambe maritima, or Sea-Kale, from our barren shores, to our best cultivated gardens, and for transforming it, by means of culture, from a plant scarcely eatable, to one of the most delicate vegetables with which our tables are enriched, at a time when Asparagus cannot be obtained. Mr CURTIS of London, indeed, was the first who published to the world an account of the proper culture of Sea-Kale; but his knowledge of that culture was derived from Dr LETTSOM's garden at Camberwell. To the late Dr LETTSOM, Britain

is also chiefly indebted for the introduction, both into our gardens and fields, of the Beta Cicla, the Mangold-Wurzell of the Germans, the Root of Scarcity, as it has been often styled, —a name founded on the error of a French Translator, not sufficiently acquainted with the German language; who mistaking the word Mangold, *beet*, for Mangel, *scarcity*, translated Mangold-Wurzell, *Racine de Disette*. In this error, he has been followed by many of the British, who have termed this Beet-Root of the Germans, the *Root of Scarcity*. But by whatever name this peculiar species of Beet may be denominated, there can now be no doubt, that both its root and leaves afford a most abundant produce, and a highly useful food both for man and beast. This has been abundantly demonstrated by communications published in our Memoirs, from different parts, but especially from the Island of St Helena, where the culture of it was extensively introduced by Governor BEATSON; and where it may afford, to the Corsican Tyrant, in his state-prison, demonstrative evidence, that the benevolent individual who preserves the human race, lives a much happier, and dies a much greater man, than the untameable Beast of Prey *, who reaches even an imperial dia-

* *Vide* STEWART'S Preliminary Dissertation to the Supplement of the Encyclopædia Britannica, p. 64. 4to, Edin. 1815.

dem, through oceans of human blood. But why should I contrast characters so opposite,—the most aimable, with the most detestable! Of Dr LETTSOM, I shall only observe, that while it was his lot to remain in this world, he enjoyed no luxury so much, as the luxury of doing good: And I have no doubt, that now he reaps the fruits of his virtues on earth, in another and a better world.

The loss which our Society has sustained by the death of such men, as the late Duke of BUCCLEUCH, Mr HUNTER of Blackness, Mr NICOL, our first Secretary, Lord TORPHICHEN, Dr LETTSOM, and several others, will not soon be supplied. But even this day, has added to our list, several highly respectable names, both at home and abroad *. And although the state of our finances, does not yet admit of purchasing an Experimental Garden, I am happy to tell you, that experiment does not languish. Our industrious Experimenter, who is now enabled to retire from the laborious part of his profession,—like another Cincinnatus, digging at his ease †, his own potatoes for his own table,—is engaged in very interesting experiments in se-

* Earl of KELLIE, Earl of HOPETOUN, Lord DUNDAS, C. W. W. WYNNE, Esq. M. P., Dr MATHEW BAILLIE, Dr A. F. SCHWEIGGER of Konigsberg, &c. &c.

† *Otium cum Dignitate*, translated by an elegant Classical Scholar, *Ease and Digging Tatoes.*

veral different gardens. And I have peculiar pleasure in informing you, that one of the most respectable, as well as the most opulent of the Scottish Peers, who makes a proper use of a princely fortune, and who possesses an excellent garden in the centre, I may say, of the New Town of Edinburgh, has invited me to make whatever experiments the Council of this Society may think proper, in his garden, and at his expence; and I trust, we shall avail ourselves of his patronage, with that attention and prudence, which such an offer is well entitled to expect.

But even this liberal offer, does not put it in our power to conduct all the experiments which your Council have in contemplation, with every advantage. There are some of these, the result of which cannot be known till the lapse of many years, nay even perhaps of centuries. New fertile seed may certainly be produced, by impregnating the pistillum of one tree, with the pollen from another. But before this vegetable mule can arrive at a bearing state, many years must elapse. Tedious, however, as the process may be, the production of hybrid fruits, may afford to posterity, both aliment and luxury, with which the world has hitherto been unacquainted. Experiments of this kind, can only be performed with advantage, in a garden which will descend from one generation of our Society to another. A garden,

therefore, permanently their own property, is an object to which the views of the Society should be constantly directed; and from which, the funds intended for that purpose, should not be diverted.

From this circumstance, I was, I must acknowledge, at first disposed to receive rather unfavourably, a proposal made by one of the most respectable Members of our Society; although I am convinced it may tend materially and immediately, to the improvement of Scottish Horticulture. I need not remind you, that at a late public meeting of this Society, Sir JOHN SINCLAIR, whose truly patriotic and successful exertions, for the improvement of British Agriculture, are too well known, to require any encomium, mentioned, that he had made, during the course of last summer, an agricultural survey of Holland and Flanders. From what he there saw, he was convinced, that our Professional Gardeners might adopt with advantage, some of the practices employed in these countries. He therefore proposed to us, that a Horticultural Survey of the Netherlands should be instituted, under the direction of this Society. To that survey, one objection only occurred,—the want of necessary funds. But it has been suggested, that many of our number would cheerfully contribute to so important an undertaking. And as our Society is now numerous, it has been calculated, that by a voluntary contribution of one additional Guinea,

from those who approve of this measure, a sufficient sum might be obtained, for carrying it into effect. Your Council, therefore, have directed the Treasurer to collect, with the contributions for the year 1816, from those who approve of this measure, an additional guinea, as a voluntary subscription for the Horticultural survey of Holland and Flanders.

From these countries, it is well known, that our first great improvements in the cultivation of our gardens were derived; and from them, not a little may still be learned. If sufficient funds can thus be obtained, a deputation of two or three of our Practical Members, aided perhaps by our Secretaries, may, by being the eye-witnesses of the state of gardening in the Low Countries, import useful practices into this country.

I shall not now flatter you, by stating my own sanguine expectations, from the proper execution of this plan. I shall only conclude, with expressing my confident hope, that the result of such a survey, published to the world, through the medium of our Memoirs, may convey useful knowledge to every Gardener in Scotland.

DISCOURSE, &c,

Delivered on the 3d December 1816.

GENTLEMEN,

BY direction of your Council, I am now to perform a duty, which, to me, is a very pleasing one. I am to intimate, that they have awarded honorary marks of the Society's approbation, to two of our members, who, in their opinion, have deserved well of this Institution,—to Mr JOHN HAY of Edinburgh, and to Mr ARCHIBALD GORRIE of Rait, in the county of Perth.

I need not tell you, that the great object which the founders of our Society had in view, was the improvement of Horticulture by Experiment; nor need I mention, that our Memoirs, already published to the world, contain the details of many successful experiments, performed in some of the best gardens in Scotland. The gardens of our

late truly patriotic President, the DUKE OF BUCCLEUCH, particularly those in Dalkeith Park, have materially contributed to the attainment of this object, as is abundantly demonstrated by the numerous premiums adjudged to his excellent gardener Mr MACDONALD. His scientific skill in his profession, and the new modes of culture which he has employed, have produced specimens of the finest fruits, in our own climate, and even in the worst of seasons.

But to his Grace's gardens, we are still more indebted for successful experiments, tending to the improved culture of some of the most useful products of our garden as articles, not of luxury, but of food. As examples of this, I need only mention Mr MACDONALD'S new mode of cultivating Onions, by transplanting them from the seed-bed at a proper time, and in a proper manner; and his no less interesting improvement, in the culture of Currants, for supplying, particularly to the lower classes of the community, one of the best and safest cordials, Domestic Wine. By his new mode of pruning the currant-bush, after the fruit is fully formed, and when it requires for bringing it to the greatest maturity, all the sunshine which our climate can supply, the qualities of the currant for wine-making are very much improved.

In the way of experiment, we have also been particularly indebted, to our present worthy Pre-

sident, the EARL OF WEMYSS, who, as you all know, with that liberal spirit, which does honour to nobility, has invited us to perform at his expence, in his excellent garden situated nearly in the centre of the New Town of Edinburgh, any experiments which we think can be there properly accomplished. But although the zeal of these Noblemen, and of other opulent and public spirited Amateurs, is, we may say, conducting horticultural experiments, in every quarter of Scotland, from the banks of the Tweed to the Pentland Frith, for even in the counties of Ross and of Caithness, the exertions of Sir GEORGE MACKENZIE and Sir JOHN SINCLAIR, have been very great; yet much more remains to be done than can be accomplished, by any assistance of that kind, or during the precarious life of any individual. Many of the most interesting objects, which the Council of this Society have in contemplation, can only be accomplished by a garden appropriated to ourselves, and which will descend from one generation of the Society to another.

With the view of giving a beginning to such a garden on a proper plan, your Council circulated *

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* CIRCULAR.

"SIR, *Edinburgh, 1st February* 1816.

"The Council of the Caledonian Horticultual Society, having resolved to give a premium for the best plan of an *Experimental Garden*, and to confine the competition among the Professional Members of the Society; you are now informed, that

intimation among their professional members, that at this meeting, two honorary medals would be awarded to those who presented them, with the best designs for an Experimental Garden. And in consequence of the decision of the judges to whom these plans were referred, (Sir GEORGE MACKENZIE, Mr NEILL, and myself,) I now intimate to you, that they have awarded the Society's gold

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the Gold Medal will be given for the best plan, and the Silver Medal for the second best.

"You will observe that the extent is to be two acres; and that the plan must be drawn to a scale, by which the contents of every part, the dimensions of walls, espalier-rails, &c. may be known. The plan must be accompanied by a description, and a clear statement of the allotment of each division, and of such changes of crops, &c. as may be considered expedient; keeping in view those objects for the improvement of which the Society was instituted.

"It is also desired that room be allotted for stock-plants of every new and approved variety of apple and pear as standards; and it may be considered whether it will be more advisable to have them together or dispersed through the garden.

"Your opinion in regard to aspect, soil, and subsoil, may be mentioned; and it may be useful to allude generally to such situations in the neighbourhood of Edinburgh, as may be deemed most eligible.

"Dr DUNCAN *senior*, Vice-President, Sir GEORGE MACKENZIE, Bart. and Mr NEILL, have been appointed judges. The plans must be sent to me, on or before the 1st day of November next; and the report of the judges will be made to the Quarterly Meeting in December. I am, &c.

(Signed) "PAT. NEILL, *Secy.*"

medal to Mr HAY, for plans, which I hold in my hand, and which have been judged the best; and I am to inform you also, that they have awarded the second prize, your silver medal, to Mr GORRIE, for a plan, which is also upon your table.

As soon as circumstances shall enable us to carry this important design into execution, both plans, as well as the memoirs with which they are accompanied, will, I am convinced, afford information highly conducive to the public good. Into the detail of these plans, however, I cannot at present enter. Permit me only to observe, that particular attention has been paid to our request by Mr HAY. His taste and judgment in planning gardens, is well known to every amateur at Edinburgh, by the admirable specimens which he has afforded them; in the garden which he designed for the late worthy Lord TORPHICHEN at Calder House; in the beautiful garden, and splendid suite of hot-houses, which he planned and constructed for Sir JOHN CALLANDER at Prestonhall, now the property of our fellow member Mr HIGGINS; and in the still more extensive garden, and noble range of forcing-houses, of which he is at present superintending the execution, for the Earl of ROSEBERY at Barnbougle. The last of these, when completed, will, I have no doubt, from the mode of heating, watering, and many other particulars, excite the admiration of every gardener who shall view it with a discerning eye. Mr HAY has fur-

nished us with two different plans. One of them may be placed in any situation in the neighbourhood of Edinburgh, which may be thought most commodious. The other is intended for a particular spot, in the vicinity of the Palace of Holyroodhouse. This spot, if it can be obtained, will, in my opinion, be attended with many peculiar advantages, because it will be immediately contiguous to what is intended for the New Royal Botanical Garden.

I need not tell you, Gentlemen, that the Royal Botanical Garden, at this place, situated between Edinburgh and its sea port, is now, from the formation of new roads, and from the increase of trade and manufactures, no longer fitted for the important purposes for which it was established: and by Royal authority, the Barons of his Majesty's Exchequer, have lately purchased a more commodious field of about ten acres, to which the Royal Garden is soon to be transferred. Immediately adjoining to that field, is another at present for sale; and Mr HAY, presuming that our Society might be able to make a purchase of two acres of that ground, has drawn a plan particularly suited to that spot.

These plans, your Council will, without delay, take under most serious consideration. As an individual member of that Council, I must confess I am very partial to the last-mentioned plan. But, at the same time, I connot help considering it as

much more limited than the public good requires.

The whole of the field, to which I allude, at present for sale, is about ten acres. Many advantages would be obtained, and many serious inconveniencies would be avoided, by purchasing the whole. And the whole is by no means too large for those important objects, which the Caledonian Horticultural Society ought to have in view, for an experimental Garden.

Mr HAY has pointed out five different objects, which should claim attention, for the improvement of horticulture,— a Herbarium, a Culinarium, a Pomarium, a Sylva, and a Flora. The first of these, is indeed the peculiar province of the Botanical Garden strictly so called. The purchase already made by Royal authority, will, I have no doubt, fully answer that purpose. From the intelligent men, to whom the formation of it will necessarily be committed, I trust, it will soon be able to boast of containing a specimen of every plant, which can be reared in Britain, either under all the inclemencies of our climate, or with the aid of all that protection which human genius can devise. The Royal Botanical Garden at Edinburgh, long celebrated for the rich variety of plants which it contains, has been the first to introduce into Britain, several vegetables highly useful in medicine. As examples, I may mention

two,—the Rheum palmatum, and the Ferula assafœtida; for both which, we are indebted to the indefatigable industry of the then worthy Professor of Botany, the late Dr JOHN HOPE. There can, I think, be little doubt, that, with the superior advantages which the Royal Garden at Edinburgh will hereafter enjoy, it will claim the admiration of every part of the world, where a knowledge of arts and sciences has made any progress.

But the four other objects pointed out to us, are no less immediately connected with the public good. In the Culinarium, the culture of every kitchen-vegetable, daily employed in food, by almost every inhabitant of Britain, might unquestionably be much improved. The Pomarium, it cannot be doubted, might, in process of time, furnish us with new varieties of almost every fruit, even of our most common fruit, the apple, much superior to any hitherto known in Britain. The Sylva, by the production of genuine and fertile seed, might clothe both our hills and our heaths, with forest-trees, more valuable for the purposes both of civil and naval architecture, than even our hardy oak, the pride of Britons. And, finally, our Flora, though less immediately calculated to supply the wants, or add to the conveniencies of human life, might furnish an inexhaustible source for providing the British Fair,

with every flower, either sweet to smell, or pleasing to the eye.

It is indeed true, that we can never expect to see ground for a Garden, on so great or so useful a scale, purchased from the scanty funds of our own Society, the greatest part of which, for more than twenty years to come, is already, I may say, appropriated and pledged to the public, for premiums leading to horticultural improvement. But thank God, we live under a liberal and enlightened Government, under the reign of a KING, who for more than fifty years has been the Father of his People, and at a time when the power of the Crown is vested in a SON, whose chief ambition it seems to be, to follow the footsteps of the best of Kings, and who, like his beloved Father, will consider the encouragement of Agriculture and of Horticulture, as objects highly conducive to the comfort and happiness of his people, and well deserving the attention of a Patriot Sovereign. I am, therefore, by no means without hopes, that the purchase for a Royal Garden, near the ancient Palace of our Scottish Monarchs, may be extended from ten to twenty acres; and that, while the one-half of it, is dedicated to a Botanical Garden, a Herbarium, under the direction of the Regius Professor of Botany,—the other half, under a King's Gardener, or Regius Professor of Horticulture, may be appropriated to a Culinarium, a

Pomarium, a Sylva, and a Flora, and put under the direction of this Society for useful experiment.

I am indeed aware, Gentlemen, though we are now, by the blessing of Providence upon the efforts of those heroes who have led to battle our intrepid fleets and armies, delivered from a bloody and expensive war, that the present is a distressful period. The cry of economy from the mouths even of the most turbulent spendthrifts, is constantly deafening the ears of Government to every proposal for improvement. I am, however, fully satisfied, that the patriotic Representatives of the people in the British Parliament, are men of sentiments too enlarged and enlightened ever to suppose that penury is economy. They well know, that it is better to fatten the industrious labourer by the reward of his exertions, than to encourage idleness even in times of distress, by giving a premium to begging. Every sixpence, bestowed on a Royal Garden, would go immediately into the pocket of the ingenious mechanic, or of the diligent gardener, and thus add to the inestimable blessings which Britons have been accustomed to enjoy during seasons of peace and plenty.

Even, therefore, during the present times, we need not despair of obtaining the aid and the countenance of Government. But although an event, so desirable for the public good, should not immediately take place, yet, in my opinion, Gentlemen, even with the present state of our own fi-

nances, the commencement of our Experimental Garden should be no longer delayed. The period has now arrived, when we may give such a beginning to Mr HAY's excellent plan, as will afford demonstrative evidence, of the national importance of executing the whole; and I trust that before we again meet in this room, for the purpose of another annual election, the Council whom you have now appointed will have made some progress in this interesting undertaking.

HORTICULTURAL MEMOIRS.

No. XXXIII.

Report of the Committee for Experiments on the Naturalization of Useful and Ornamental Plants, under the Climate of Scotland; with Prefatory Remarks on the Character and Economical Uses of Forest Trees already introduced, and an enumeration of certain Exotic Plants, which have lately withstood the Winter of North Britain.

Drawn up by JOHN YULE, M. D. F. R. S. EDIN.

(Read March 1814 *&* 1816.*)*

THERE is no part of the history of our country more pleasing and intructive than that which traces the progress of the useful arts. In viewing, for instance, the efforts of our ancestors in the practice of agriculture, gradually conquering the physical obstacles of soil and climate, we are inspired with that confidence necessary to success in every enterprise; while, an unprejudiced account of their errors and consequent failures, no less strongly warns us to avoid them.

It is therefore imposible to contrast the present advanced state of culture, either of our fields or gardens, with the ancient imperfect state of both, without being stimulated to farther exertion, and eventually, to incalculable improvement: For one step in the progress of discovery invariably leads towards another; as no useful fact can become insulated, but sooner or later tends to the developement of others.

Our Highland districts, now abounding with the most improved breed of Sheep and Cattle, were, in the time of Julius Cæsar, with few exceptions, so many extensive forests, the resort of the Stag and the Roebuck, and these, chiefly, the prey of Wolves and Foxes; whilst a great part of our less elevated lands, at present producing abundance of grain, the potato, the cultivated grasses, and, even during winter, the most succulent and nutritious roots, were, at that period, overspread with extensive marshes; and the scanty portion under a wretched husbandry, but ill repaid the labour bestowed upon it. An increase of the means of subsistence and of population, however, is not the only result of improved cultivation. The removal of forests and the draining of marshes, have rendered our climate not only more healthy, but milder. The intermitting fever, formerly so general in the Lowlands, has now entirely disappeared; and although, with respect to plants, the effects of an amelioration of tem-

perature, from the defect of accurate observations, be less obvious, they are equally certain; for it is not the moisture and impervious subsoil only, which render marshes totally unproductive: The perpetual evaporation from their surface chills the efforts of vegetation, and the cold thus produced is not merely local, but extends through the atmosphere to the adjoining country, and the blight becomes general.

Whilst, therefore, our climate has been necessarily rendered more temperate by the clearing of the ancient forests, it must have become still more so by the general draining of the soil, within the last sixty years, during which, by the admirable improvements in agriculture, gradually introduced, the quality of the crops raised has not only been improved, but the produce itself more than doubled in quantity.

That general horticulture and planting should have advanced in an equal degree, could not be expected. Many exotic plants adapted to these departments are, on their first introduction, more tender than those of the field, long naturalized under our variable climate; and besides, it is evident, that the demand for the necessaries of life must be more urgent, than what is only more remotely useful. That these arts, however, may as closely as possible keep pace with agriculture, is one of the chief objects of our association; and to contribute in some degree towards this end, has been the sincere wish of your Committee,

although the difficulties encountered at every step will apologise for the limited progress it has been able to make. One great obstacle to success, including indeed every other, arises from the want of funds for the establishment of a Public EXPERIMENTAL GARDEN, dedicated chiefly to the culture and naturalization of useful and elegant plants; but when the obvious utility of such an institution shall be more generally felt, there can scarcely be a doubt of the necessary expense being speedily provided; an increase in the means of subsistence, and the embellishment of the soil of our country, including, doubtless, the most important parts of public economy. The truth of this will be readily admitted by every one who reflects on the incalculable advantages already derived to the public from this source. The grain and leguminous plants of different species, now growing in every cultivated field, came originally, through Egypt, from India: Our finest fruit-trees, increased by the numerous varieties of the Apple, the Pear, the Peach and Apricot, from Persia and Asia Minor; and the equally numerous Plums, for instance, the gage (Cadiz) plum, was originally introduced into the south of Europe by the Arabians, to whom we are indebted for some of the most valuable of the arts.

Previously to enumerating such plants as have been naturalized to the climate of North Britain under our own immediate inspection, we shall

briefly describe and notice the economical uses of such forest and other trees, as, although long partially introduced, are still but imperfectly distinguished from each other by the generality of practical planters and land proprietors,—circumstances the more to be regretted as the evil, arising from such error, is generally discovered too late to be corrected.

I. *Larch Family.*

The utility of an accurate distinction of character in such cases, may be illustrated by noting, what has in this country actually occurred with respect to the Larch; two if not three distinct species, which require different situations as to climate, having been occasionally confounded in our plantations.

1. The *common* or *white Larch*, (*Larix pyramidalis*, Salisb. *), was first introduced into North Britain by that distinguished patriot and philosopher Henry Home, Esq. (Lord Kames), in 1734 †; and soon afterwards the grandfather of the present Duke of Athol planted a number of these trees in the lawn of Dunkeld, which, in somewhat more than fifty years, attained nearly the height of

* Lin. Trans. viii.

† Lamb. Pin. t. 35.

one hundred feet; and at five feet from the ground, a circumference of eight feet; a rapidity of growth which has been already proved by no means to diminish the density and durability of the timber, now found equally adapted to the purposes of naval and domestic architecture. In this species the cones (*strobili*) are oval, and at least an inch long; the scales notched and open, and even bent somewhat backwards in the margin; circumstances carefully to be observed in purchasing or gathering them for use. The common Larch, then, although a native of Switzerland and the south of Europe, attains its full perfection in the valleys of the Highlands. Besides the great value of the timber, it is well known that, abroad, the Venice turpentine is obtained from this larch; and, we may add, that the bark has lately been found to be well adapted to the purpose of tanning of leather *.

2. *Black Larch* (*L. pendula*, Salisb. †) is far more tolerant of cold than the last, and in fact its native country is northward of the River St Lawrence in America, where it occupies forests for miles, attaining the height of eighty or a hundred feet. In this country, then, in planting the Black larch, it ought to be associated with our native pine (*Pinus sylvestris*) in the more elevated

* Thomson's Annals of Philosophy for July 1817.

† Lamb. Pin. t. 36.

parts of the Highlands, as more neatly approaching its high geographical situation. In Forfarshire, however, we are informed that there are thriving specimens of the height of sixty or seventy feet. Even in America these trees are scarcely to be found farther south than the most shaded and coldest quarters of the Jerseys, Pennsylvania, and the mountainous parts of Virginia. The *cones* of this species, it must be noted, are not only much smaller than those of the common larch, but are oblong, and their scales incurved in the margin, and not open like the last. The leaves of this larch are likewise scarcely half the length of those of the common larch. The timber is more highly prized in America than that of any other of the coniferous trees, and serves both for naval and domestic purposes. Such as possess the necessary curvature, are in great request for knees in ship-building. With respect to the black larch, a practice is prevalent in this country, of which we cannot too strongly express our disapprobation: the lower pendulous branches had been observed to strike root,—a circumstance which has led to the attempt of raising them from layers, and thus dwarfs are necessarily produced instead of trees of the natural size, raised from the seeds, by importing the cones from North America.

3. The Red Larch, (*L. tenuifolia*, Salisb. *L. microcarpa*, H. Kew, described by Bartram, and figured in t. 37. of Lambert's work), has the cones nearly of a spherical form, and only half an inch

in length. This larch we have not as yet closely examined, but it is generally accounted a distinct species: There is an imperfect specimen of it, however, in the Botanic Garden, Leith Walk. Michaux the elder, considered this as only a variety of the last. It is a native of the most northern parts of Canada, and is of course sufficiently hardy, and it is said was long since cultivated by the Duke of Argyle.

4. The *Cedar Larch* (*Pinus Cedrus*, Miller's Dict. *L. patula*, Salisb. 3. Lin. Trans.) differs from the two last-mentioned species in possessing biennial or evergreen leaves,—a property that renders it peculiarly ornamental, in the borders of the lawn, in winter. With us, in the Lothians, however, it attains only the height of a middle-sized tree, flat on the top,—a circumstance probably arising from the leading shoots being killed by early frosts. Taller and more handsome trees, might be obtained by sowing a few seeds in pots, or in baskets, (*manaquins*), sufficiently deep, a number of which might be provided on purpose, and, selecting the best plants, placing them where they are to remain without transplantation, or with the ball of earth attached to them; thus preserving the perpendicular descending root, a circumstance of the first importance in planting every kind of forest-trees, and especially the Coniferæ. The cones of the Cedar larch are much larger than those of the rest of this family, being three inches long, with a proportionate circum-

ference; the scales of the cone are erect and truncated. These ought to be obtained, if practicable, from the Levant as fresh as possible. The Cedar should be associated with the common larch in the valleys of the Highlands, or other inland districts.

II. *The Fir* or *Spruce Family*,

although possessing alternate leaves like the larch, differs widely from it in the form of the buds, structure of the flower, and general aspect. The spruces are all well known to be hardy. The species affording timber most in demand, is the Norway fir, (*Abies excelsa*, Sal.; *P. abies*, H. K.) and the Black Spruce, (*A. nigra*, Mich. Arb. For.; *P. nigra*, H. K.*) Among those cultivated in our nurseries, the *white spruce*, (*P. alba*, H. K. *A. alba*, Mich.) is occasionally planted in lawns, chiefly on account of its beauty during winter, the perennial leaves being of a pale bluish green, although the timber is of small value; and the tree itself, even abroad, growing only to the height of 45 feet.

It would be well, however, that the *Norway* or even the *Black spruce* were more generally planted in the valleys of the Highlands, the timber of both, especially for deals and all manner of inside-work, being infinitely stronger and more durable

* Vid. LAMB. Pin. t. 25. and 27.

than that of any other of this tribe whatever. In America, the black spruce is used for knees in ship-building, where neither oak nor black larch can be easily obtained: these knees are not prepared from two diverging branches, as in the oak; but from a portion of the base of the trunk connected with one of the largest diverging roots. According to Michaux, the red spruce, (*P. rubra*, H. K. and Lamb. P. t. 28.) is not a distinct species, as generally supposed, but only a variety of the black spruce, arising from soil and situation, and farther, that the red variety is in fact by far the most valuable of the two *. The timber of this is universally preferred throughout the United States for sail-yards, and indeed imported for this purpose into Liverpool from Nova Scotia, where it is also used for constructing casks for salted fish. It is from the decoction in water of young shoots of the black, and not from those of the white spruce, as supposed by Lambert, that the celebrated beer is prepared by fermentation, with a due proportion of sugar or molasses. The essence of spruce of the dealers, is prepared by evaporating this decoction to the consistence of honey. In closely examining this family, it appears that traces of at least two natural genera are included under it. 1. The

* "C'est dans celle nommée *Sapin rouge* (Red Spruce) que se trouve réunies au plus haut degré toutes les qualités qui font rechercher cette espèce, viz. la force, l'élasticité, et la legèreté." *Arbres For.* tom. ii. p. 128.

proper Spruces,—*A. excelsa* of the north of Europe, and *A. nigra* and *A. alba* of North America. These three species, and others might be added, agree in certain well defined characters. In all of them, the single quadrangular alternate leaves surround the shoots from whence they germinate. 2. Of the fir genus, the silver fir of Europe, (*A. picea,*) and its near relative *A. balsamea* and *A. canadensis* of North America, afford evident instances. In these, the flat and generally emarginate, lateral, and nearly pinnate leaves, at once distinguish them. An attention to accuracy of character, even in a popular view, becomes daily more urgent, in order to avoid utter confusion. The pine genus of Linnæus, then, even as characterised by Willdenow, not to mention the additional species lately described by Michaux the younger, in fact includes several kindred tribes. As, however, our object is to point out the most useful species, we shall only observe, 1. That the hemlock spruce, (*A. canadensis*, Mich.) although a tall tree, affords a brittle timber, of no greater value than that of the white spruce, (*A. alba*); 2. That the timber of the American silver-fir, (*A. balsamea*), is equally soft; the tree itself, even in America, scarcely attaining a greater height than the white spruce. The vaunted Balsam of Gilead obtained from it, is merely a variety of turpentine, possessing no medicinal property superior to that substance. In short, these three spruces, the white, the hemlock, and balsam of Gilead, scarcely de-

serve attention. 3. The silver-fir of Europe, (*A. picea*), in the valleys of Switzerland, attains, however, a magnificent height, rising above 100 feet, and affords a timber greatly superior to its American congeners. This tree requires a fresh and deep, at least a pervious soil, as it fails on a thin clay or poor sand.

III. *Pine Family.*

The aspect of the proper pines, at once distinguishes them from the Spruces or Firs, with which they are closely related. A natural distinction, is however pointed out, not only by the structure of the fruit, especially the truncated scales of the cones, but by the leaves of the pines, at least two together, being included at the base in a circular sheath.

1. Our native pine, (*Pinus sylvestris*) of which there are two or more varieties, if not species *, very different in value, is so well known to afford timber possessed of all the requisites of strength and durability, and attains such a degree of perfection in the Highlands of Scotland, that it might be thought superfluous to attempt the cultivation of

* This circumstance was first remarked by the late Earl of Haddington, in his small but valuable work on Forest Trees, and is also noticed by Mr Don in the first volume of these Memoirs.

any other; but this pine has been found to be ill adapted to the deeper and more fertile soil of our valleys, although it thrives well on mere sand, if dry at the bottom.

2. The Red Pine of Canada, (*P. rubra*, Mich. Arb. t. 1. and *P. resinosa*, H. K.) receives its name from the colour of the bark. From the high geographical range of this pine, it is well adapted to associate with the *P. sylvestris*. Mackenzie found it beyond Lake Superior in Canada. Aiton first gave the name *P. resinosa* to this species,—a term less apposite than its name in Canada, as it is in fact less resinous, than the *P. australis*, although the timber is excellent, being close-grained and durable. The main-mast of a 50 gun-ship, the St Lawrence, was made of this timber by the French when in possession of Canada. Attaining the height of 80 feet, planks of 40 feet long are imported into different parts of Great Britain; a quantity of this timber is occasionally imported into Leith. Being generally free from knots, it is used for the decks of ships, and consequently well adapted to flooring and similar purposes. It has also been imported in the form of masts into this country. As the natural range of this pine extends from 41° 30′ in Pennsylvania to 48° north, and as it thrives in a dry sandy soil, there can be no doubt of its succeeding in this country. Like the *P. sylvestris*, it affords an inferior timber on a damp and unsuitable soil.

3. The *P. pinaster*, Lamb. t. 4, 5., is now more generally planted especially near the sea, where, as in Ayrshire, it grows luxuriantly on the sea-coast, a circumstance of itself of great importance, especially as the timber is valuable.

4. The *Swamp* or *Georgia Pitch*, or *Long-leaved Pine*, (*P. australis*, Mich. t. 6., *P. palustris*, H. K.) notwithstanding the warmth of its native climate, will probably be found to succeed in our sheltered valleys, and on the borders of inland lakes. Indeed, this pine already grows freely and promises well near Bourdeaux, in the west of France, in situations scarcely more favourable. The value of the timber, on account of strength and durability, is well appreciated in every part of North America, and it has been occasionally imported into this country, especially at Liverpool, some time since, for the use of the Wet Docks, in planks, from fifteen to thirty feet in length, by twelve or twenty inches diameter. These planks are rated 20 *per cent.* higher than any other American timber, if we except that of the Black Larch. It is, indeed, on account of its strength and durability, in request for all the purposes of carpentry, and is only equalled in value by the timber of the Common Larch, Scottish Pine, and Norway Spruce. It affords turpentine in greater abundance than any other American species; and the volatile oil, rosin, and tar, so much in demand in the various arts, are occasionally imported into this country,

Upwards of 40,000 barrels of this tar, were in 1807 imported into Liverpool.

5. The *P. strobus* or *Weymouth pine*, has been long introduced. It is of quick growth, elegant in appearance, and attains to great height, and is occasionally planted in Scotland; but the timber is not durable under exposure, although very valuable, when completely dried, for finishing, and inside work. The blue-green of the pencilled leaves, of which five are included in each sheath, greatly adds to the picturesque appearance of this pine on the lawn in winter. It has been observed to withstand the rigour of the sea blasts in Nova Scotia better than any other tree,—a property that would seem to point it out as valuable in our insular situation. The Weymouth pine, from the lightness of its timber, and the majestic size it attains, has been used for masts, for which, however, it is certainly very inferior to our native species, *P. sylvestris*, as it is apt to rot at the summit. In the fresh, deep and black sand on banks of rivers in America, it has been observed to attain the height of 180 feet, with a proportionate diameter; but this lofty inhabitant of the forest is daily becoming more scarce, and the growth of centuries disappears for ever. It is remarkable, that the preservation of this pine was enjoined on the colonies by several acts of the British Parliament.

IV. *Cypress Family.*

The European, as well as American species of Cypress, are closely related to the other coniferous tribes, although they differ remarkably in the imbricated position of their opposite leaves, which are generally closely pressed to the branches.

1. Of this, one of the species of the South of Europe, *(C. sempervirens)*, or common cypress, has been long celebrated by Pliny, on account of the incorruptibility of its timber *, which is red-coloured, close-grained, and odorous. Two varieties of this species, have been long introduced; but the sombre green of both, formerly consecrated to funerals, probably led to their being neglected.

2. *Cupressus thyoides*, (Mich. Arb. t. 2.) or White Cedar of the middle States of North America, is one of the most valuable of the cypresses. Although the growth is slow, it attains to the full height of the first class of trees in the swamps of the middle States towards the ocean, scarcely extending farther inland than fifty miles from the coast. It is very improperly named the Juniper tree in North Carolina and Virginia. The timber is finely grained, and works well, and being of a rose co-

* A statue of Jupiter, formed of this wood, and placed in the Citadel of Rome, is said to have lasted for centuries.

lour, odorous and light, is of extensive use for utensils; and when of sufficient diameter, is applied to every purpose where durability is particularly necessary. This species was first introduced into England by the public-spirited Collinson in 1730.

2. *C. disticha*, Mich. Arb. F. t. 1. (which, by the bye, seems to belong to a genus distinct from *Cupressus* *), although deciduous, is deserving of being more frequently cultivated, especially as its geographical range in America, extends beyond 50° N., under a temperature occasionally far more severe than occurs in the valleys of the Highlands of Scotland; and southwards, to the deep and rich soil of Florida and Mexico, where it grows to upwards of 100 feet. The timber is much esteemed abroad, on account of its strength and durability. In our Lowlands, the tops of the young plants are generally injured by frost during winter. Humboldt lately observed some of these trees still growing in the ancient gardens of the Emperors of Mexico, planted before the invasion by the Spaniards. Those planted by Duhamel, forty years since in France, are at present (1817), forty feet high, by about twelve inches diameter. In a nursery lately established in the south-west of France, seeds of this tree, obtained from South Carolina, were sown in 1803:

* Since this summary was put to the press, Humboldt informs us, that Richard of Paris, whose accuracy is well known, has distinguished this tree by the generic name *Taxodium*.

fifty of these trees, in 1813, had attained a height of from 20 to 30 feet. This beautiful tree, then, merits much more attention than has hitherto been paid to it in Scotland. The cones can be easily obtained from Charleston.

V. *Thuia Family.*

The *Thuia occidentalis* or *American arbor vitæ*, (Mich. Arb. t. 3.) has been long planted in this country, especially in lawns and shrubberies. Specimens from 17 to 20 feet high occur in the Edinburgh Botanic Garden, planted by the late Dr Hope. Although the foliage be of a deep green colour, it is an agreeable object in winter. The form of the *T. orientalis*, that of a cone, differs from most others of the coniferous series, scarcely any part of the stem being visible, the dense horizontal branches covering it to the base. Notwithstanding the deep green of the ramuli, everywhere imbricated with oval opposite leaves, both this species, and the *T. occidentalis*, are far more ornamental, and grow taller, particularly in moist situations, as at the sides of lakes or rivers, than others of the kindred family of *Juniperus* hitherto introduced; but as they are of slow growth, in the Lowlands at least, the timber of the American species, although highly valued in the northern States, on account of its incorruptibility, can scarcely with us be an inducement to its culture. The *T. cupressoides*, another species of *arbor vitæ*, was lately introduced by Dr Roxburgh from the Cape of

Good Hope. In this, the branches and foliage are not flat as in the two first, but surround the young shoots. It is as yet confined to the greenhouse. There is a fourth species of Thuia, *T. dolobrata, Kwai* of Kæmpfer, which grows to a magnificent size in Japan. This beautiful tree has not as yet been introduced into Britain. There is now scarce any hope of obtaining the seeds of this and other oriental trees, since the Dutch have obtained possession of Java, unless perhaps from Prince of Wales Island, hitherto unexplored by naturalists.

VI. *Juniper Family.*

This family, although the external appearance of the fruit is remarkably different, forms a link in the great coniferous series. Our native juniper, *(Juniperus communis)*, is a well known but neglected shrub, generally left to be cropped by sheep. Under proper management, however, it attains the height of twelve feet. The Swedish variety, is more erect, and is less branched. The Virginian juniper, *(J. Virginiana)* or Red Cedar, even when raised from the seed with us, scarcely attans the size of a tree, yet the wood is close-grained, durable, and, being odorous, is much esteemed for several purposes; but the many miserable specimens of this and the various species of *J. oxycedrus, lycia, phœnicea*, &c. to be seen in our shrubberies, acquire their stinted and bushy appearance from being raised from layers instead of seeds sown where they are to remain, or in deep

pots or baskets, to be afterwards placed in their proper situation. Two species have within these few years been introduced, that deserve immediate attention,—the *J. Chinensis*, by the East India Company, and *J. excelsa*, by the celebrated Sir Joseph Banks, in 1806, from Siberia, with which we are as yet very imperfectly acquainted.

VII. *Walnut Family.*

To the common walnut, (*Juglans regia*), which in favourable seasons ripens its fruit in our inland sheltered valleys, the *Black Walnut* of North America, (*J. nigra*, Mich. Arb. t. 1.), ought to be added. This tree is sufficiently hardy, and grows more freely and taller, than is generally the case with the common walnut. The value of the timber is well appreciated in America. The heart-wood is at first of a violet colour, but speedily becomes almost black, and hence its name. When properly dried, it strongly resists putrefaction, and is occasionally used at Philadelphia for knees in ship-building; but the great demand for it is in ebenistry, or inlaid work, on account of the fine polish it assumes, and indisposition to warp or crack. It is preferred to every other wood for stocks of muskets, and is indeed applicable, like that of the common walnut, to most of the purposes of the cabinet-maker. In order to obtain the good properties of both species, it is proposed to graft the common, on the stock of the American walnut. The pacane walnut, (*J. olivæformis*), is cultivated in the vicinity

of Paris for its fruit, and might also be tried here, as it is sufficiently hardy, and the fruit very delicate; but as it is of very slow growth, it is proposed by Michaux to graft this on the stock of the Black Walnut. The Walnut family are supposed by Linnæus to be peculiar to America. It is, however, difficult to conceive how the Common Walnut should have so early found its way into Persia from the great western continent. On the principles of the natural arrangement, this family admits of subdivision: 1. Those whose buds are naked, like those of the walnut: 2. Such as have their buds covered with scales, as in the hickery. This affords a more certain distinction than the simple or compound form of the spikes.

VIII. *Chestnut Family.*

To the *Common Chestnut-tree, (Castanea vesca)*, which ripens its fruit in our sheltered valleys, and the value of whose timber, for various purposes of the house-carpenter, is well known, we ought now to add a distinct species, *(C. microcarpa?)* from North America. This chestnut, like our European species, occasionally attains a magnificent size. Michaux measured several of them in the mountains of North Carolina, of the circumference of fifteen and sixteen feet, with a proportionate height. Like that of our own, the timber resists putrefaction, and when the tree is not too old, possesses great strength; yet the too old wood of this, like that of the last, is occasion-

ally found brittle; and the chief demand for it, is in the construction of casks, and when young, it is much used for hoops, &c. The nuts, although excellent, are smaller than those of Europe, especially such as are cultivated in the neighbourhood of Lyons. These are now grafted on the stock of the American species, at Philadelphia and New York, with great advantage. Mr Neill, in the excellent summary of Horticulture, published in the Edinburgh Encyclopædia, informs us, that in Devonshire, where this tree is cultivated on account of the fruit, grafts are taken from branches bearing the largest and finest nuts. The introduction of stocks raised from the American fruit might therefore be practised with advantage. Grafting *en fente* is generally preferred. The dwarf American species, *(C. pumila)*, seems to deserve no attention from us.

IX. *Oak Family.*

It might seem unnecessary to add any other to our excellent native species of oak, *Quercus robur* and *pedunculata*, the latter being of all others the most valuable. This is distinguished from *Q. robur*, by the marked circumstance of the acorns peing placed on long fruit-stalks, whilst those of the *robur* are nearly sessile. Besides the superior utility and hardness of the timber, the pedunculated oak is in fact the most magnificent of the two British species. There is a fine specimen of the *Q. muscosa*, or Mossy Cup Oak, in the Botanic Garden, planted by the late worthy Professor

of Botany, Dr Hope. It thrives here even in the poorest sandy soil. The mossy cup oak is found chiefly on the banks of the river Hudson, above the city of Albany, in that part of the State of New York named Genessee. The acorns, which are of an elongated oval shape, are nearly enveloped by the cup, which, as in several other species, is covered with scales, whose points are generally bent backwards; terminating at the border of the cup in filaments. This tree has a fine appearance, although, from the scarcity of specimens, we are as yet unacquainted with the nature of the timber. The numerous oaks, above seventy, now described, afford a great choice for different situations in our island. The several varieties of the *Q. ilex*, having succeeded so well in various parts of Scotland, certainly encourages us in the introduction of other evergreen species. The Cork oak *(Q. suber)* is far inferior in appearance to the ilex, although, as well as the Kermes oak, *(Q. coccifera)*, the evergreen leaves render it interesting to us. The Kermes oak was introduced upwards of a century ago into the Edinburgh Garden by Sutherland, the eminent superintendant, with many other plants then unknown in the collections of Britain. This oak is nearly related to ilex, but seldom attains a height of above twenty feet; whereas the ilex, under favourable circumstances, grows to a tree of the second class. There are some fine specimens of the ilex, at Mount-Stewart, in the island of Bute, planted

by the late Earl, with several other foreign trees; and some large specimens of the evergreen oak occur also at Castle-Kennedy, the seat of Lord Cassilis. But the first of these trees of which we have any account as planted in Scotland, were introduced by the late patriotic Earl of Haddington, into plantations on the estate of Tyningham in East Lothian. To these evergreen species, the *Q. virens* or Lace Oak (Mich. Arb. t. 11.) ought to be added in our collections; for although abounding chiefly in the southern states of North America, it was, so long ago as 1739, cultivated by Miller. What renders the probability of this oak succeeding with us, is, that the sea-breeze is favourable, if not indispensable, to its full growth. There is another species belonging to this great family, whose culture, your Committee would strongly recommend in the valleys of the Highlands, associated with the white or common larch, namely, the Dyer's oak, or Quercitron, (*Quercus tinctoria*, Mich. Arb. t. 22.) This oak has been already ascertained to grow freely in the neighbourhood of Paris, in a situation scarcely more favourable either as to soil or climate than may be easily found in this country. In the national collection of France, 20,000 young plants are at this moment (1816) growing vigorously from acorns, by the patriotic exertions of F. André Michaux the younger. The timber of this, like that of most other American oaks, is indeed of small value, nor is the foliage evergreen, as in those we have just

mentioned; but the great value of the bark in dying of yellow, renders it of great interest in an economical point of view. According to the experiments of Bancroft, one part of quercitron-bark, affords as much yellow colouring matter, as eight or ten parts of woad. The external cracked portions of the old bark, being of course of less strength, are not taken into account. The decoction is of a brownish-yellow colour, and is deepened by the alkalies, and rendered brighter by acids. The solution of tin, added to this decoction, affords a precipitate of a bright yellow. In dyeing wool, an equal weight of alum is added to the bark in the boiling; and the stuff being added, the colour is deepened or brightened at pleasure, according to the nature of the bath. It is scarcely necessary to add, that this, and other tender species of oak, ought to be raised from the acorns in deep baskets, and placed if possible where they are to remain, after due protection during the first two years.

X. *Birch Family.*

The utility of our native White Birch (*Betula alba*), and the elegant pendulous variety, are well known; and to this, our enterprising planters have, some time since, added certain American species, but particularly, 1. the Mahogany Birch, (*B.*

lenta, (Mich. Arb. p. 147 and H. K.) Mountain Mahogany, Cherry Birch of Canada). The bark of this tree is of a brown colour, spotted with white. It is well known, that our native birch grows to much greater size in the swamps of Sweden and Norway than with us; and in fact, rather degenerates in the richer soil and more temperate climate of Britain. The Cherry Birch, on the contrary, abounds most in the middle states of Pennsylvania, New York, and the Jerseys, where it attains a height of seventy feet, but disappears altogether in the higher latitudes of the northern states, and is scarcely to be found in Nova Scotia. It is therefore much more likely to succeed with us than our own birch, in the moist and deeper soils of our Highland valleys, especially when closely associated with other trees. The probability of this, is heightened by various facts already ascertained. The value of the timber is well known to our cabinet-makers; and we have seen tables, bed-posts, and other articles of furniture made of it, equalling in beauty those of mahogany, which it resembles, when some time exposed to the light, the newly wrought boards being of a rose-colour. Although of an exceeding quick growth, the grain being naturally close, it takes a fine polish in cabinet-work. We add to this, that the leaves, which appear early in spring, are said to possess a peculiar fragrance, which they retain when dried by means of a stove, affording on infusion of boiling

water, an agreeable diluent superior to some of the common teas of commerce.

2. The Yellow Birch (*B. lutea*, Mich. *Arb. For.*) is an inhabitant of the Northern States and of Nova Scotia. The bark is of a shining yellow, from which it derives its name. It has been termed *B. excelsa*, (H. K.), which, like all comparative terms, is improper; the last species equalling it in height, and excelling it in strength. The Black Birch, therefore, affords a better timber; and it is necessary to mark the distinction, as that of the Yellow Birch possesses a similar colour and good grain, and in fact is imported from Canada under the name of Black Birch, and used instead of it by our cabinet-makers. The seeds included in the ripened catkins, can be easily obtained from America.

3. The Black Birch, (*B. nigra*, H. K. Mich. Arb. t. 2. f. 6.) has been for some time common in our plantations. It is of very quick growth. In the twelfth volume of the Transactions of the Society of Arts, an instance is stated of this tree attaining in nineteen years, the height of forty-five feet.

XI. *Maple Family.*

Fourteen species of *Maple* have now been described by botanists, seven of which belong to Europe, and the rest to the Continent of America. The Sycamore, (*Acer pseudo-platanus,*) which, as

well as the *A. campestris*, is generally reckoned a native of our island, has been long valued, on account of the uses of the timber, by the turner, and besides it is valuable as speedily affording shelter, from its quick growth, to other young trees less tolerant of the sea-blast. The Norway Maple (*A. platanoides*, Schmidt, Arb. t. 1, 2, 3, 4,) is another hardy species valuable for similar purposes.

To these, we can now add the Sugar Maple, *A. saccharinus*, (Mich. Arb. For. 2. t. 15.) equally hardy with either. This species is first perceived to the northward of Lake St John in Canada, under the most rigorous cold, in latitude 48° during winter, nearly corresponding in temperature with latitude 67° in the north of Europe. The Sugar Maple, however, exists in greatest vigour, and abounds most between latitude 43° and 46°, comprehending Canada, Nova Scotia, and Vermont. This Maple, according to Michaux, disappears totally in the southern states; gradually diminishing in frequency from Genessee, to the higher parts of Maryland. On the whole, this maple abounds more in America than any other of its kindred; but even abroad, it does not equal the tallest class of trees. As in the rest of the tribe, the wood of this, although possessing considerable strength, is not durable under alternations of moisture and drought; but when thoroughly dried and unexposed, it is very durable, takes a fine polish, becoming of a fine rose colour on exposure to light; and the wood being

beautifully waved in its texture, and in the older trees occasionally irregularly spotted, is highly valued by cabinet-makers. This spotted wood is termed *Bird's-eye Maple*. In order to shew the full effect of these spots, the pieces must be worked parallel to the annual circles: the wood of the Sugar Maple, like that of our native species, (*Acer pseudo-platanus*), gives out in burning a greater proportion of heat than that of most other trees; and the charcoal is preferred in America for the forge to every other kind, and is said to possess a specific gravity one-fifth greater than any other known charcoal. It is well known that the maple family abound with a saccharine juice, when tapped on first rising of the sap in spring, before the buds begin to evolve; but this, as the name implies, affords it much sweeter than any other known species. The Prince of Auersberg, however, has introduced the culture of one of the European species? for the express purpose of the manufacture of sugar, having within the last ten years planted more than a million of these trees on his lands in Bohemia. The Sugar Maple, like most of the rest, requires a deep and fresh soil, to attain full perfection, at which period, the saccharine juice is most abundant. In some experiments, we made with a view to obtain sugar from the juice of the Sycamore, success was apparently prevented by the rapid vinous fermentation it is disposed to assume, and the speedy formation of acetous acid

during the boiling. Indeed, the sap of this tree is but slightly saccharine. It would seem, however, that the richer sap of the Sugar Maple is less liable to decomposition, as abroad it admits of being kept in casks for some days, in order to collect a sufficient quantity before commencing the evaporation, during which, no lime is directed to be added to the liquor, as in preparing sugar from the sugar-cane in the West Indies. Exposed to the sun, in the usual manner practised by vinegar manufacturers, the juice is speedily converted into strong vinegar.

XII. *Beech Family.*

We are as yet acquainted only with three other species of Beech, in addition to our native tree, (*Fagus sylvatica*), which, in utility and beauty, equals all the rest. Indeed, the timber of the White (wooded) Beech, (*F. sylvestris*, Mich.) of Canada and the middle states of America, although a tall and magnificent tree, is inferior to our own, both in strength and durability. But the Red-wooded species of the northern states, (*F. ferruginea*, Mich. p. 174) equals our native species in every respect, and the colour of the heart-wood, of which the proportion in this tree is generally as thirteen to three, renders its cultivation desirable for the various articles of cabinet-work,

bed-posts, &c., in which our own is at present employed. Indeed, the timber of both species is incapable of resisting exposure to alternations of drought and moisture, although it is well known to be very durable under water. There is a peculiarity in the practice of cutting this and other species of beech, when in full sap, which is generally believed to add to the durability of the timber. It may be observed, that the Purple-leaved Beech, now common in our plantations, is a variety of the common beech, totally distinct from this American or Red-wooded species. We may mention as an additional illustration of the importance of this tribe in an economical point of view, that the seeds of our native species, *(F. sylvatica)* freed from the husk, afford, by pressure, one-sixth part of a fixed oil of excellent quality, and when the process is properly regulated, nearly equal to that of olives. In Germany, and the North of France, this oil is prepared by pressure from the fresh seeds obtained from the Forests of Crecy and Compeigne in great abundance, as a substitute for that of olives. The beech-mast must be dried slowly in a granary, and the capsules removed by means of a (barley?) mill, properly adjusted for the purpose. The seeds then must be ground, and about a fifth part of water added during the grinding, to moisten the paste, which is now to be submitted to the press, in strong canvas bags. The great error in the expression of this

and other fixed oils, consists in heating the substances too much, and thus rendering the oil empyreumatic, and useless for the purposes of diet *. The seeds are ripe by the end of September. The bark of the beech, although inferior no doubt to that of oak, is employed in America in the tanning of leather, which is light-coloured, but of good quality. In this country, the beech (*F. sylvatica*) grows freely on the poorest soils, and in hedges formed by close planting and training the young plants, affords admirable fences in the most bleak situations, as the withered leaves remain during winter.

XIII. *Diospyrus* or *Date-plum Family.*

1. The *D. lotus* of the South of Europe, and *D. virginiana*, the only known American species, are sufficiently hardy, and grow in sheltered situations to the height of twenty feet. A specimen of the first is in the Botanic Garden here, and thrives under peculiar disadvantages of soil.

2. The fruit of the *persimon-tree*, (*D. virginiana*), is abroad occasionally bruised and formed into cakes, which are dried in the oven, and warm water being added to them, the liquor is fermented and used as beer. This fruit, however, even in Virginia and the Western States, requires frost

* Journal de Physique, Janvier 1781.

to render it mellow, and is certainly of little value; but as the foliage possesses considerable beauty, and the shade of this tree rather seems to protect, than to destroy the herbage under it, it deserves a place in our sheltered valleys, and on the lawn. Pursh considers the pubescent variety of Michaux to be a distinct species. The *D. ebenus*, was some time since introduced into our stove collections by Dr Roxburgh, and *D. cordifolia* and *D. obovata*, have been since introduced by Sir Joseph Banks. Even the more hardy species must be raised from seeds in pots, protected at first, and afterwards transferred to their final situation.

XIV. *Nyssa* or *Tupelo Family.*

Although the four species enumerated in the Kew list, are hardy, none of them have been hitherto raised with us. The *N. uniflora*, *N. sylvatica*, Mich., or Black Gum-tree, would most likely grow freely in our deeper soils, protected by more hardy associates, especially as they thrive to the northward of Philadelphia, even in the more elevated situations. The rest of them affect the moist or rather marshy places in the southern states. In general, the wood in all of them, is soft and of little value, although, from its indisposition to split, it is applied to several domestic purposes. There is a peculiarity in the structure of the stem in this as well as certain

other tribes. The ligneous fibres, are, as it were, in bundles, not parallel to each other, as Daubenton first observed in the wood of the palm series, but crossing each other, and warped together. It is owing to this, that the wood is applicable to certain purposes, where a disposition to split would be injurious; and it is used in Virginia for the naves of wheels of the lighter carriages, such as coaches, chariots, and cabriolets, &c., and by ship-carpenters for the cap of the upper masts. It is obvious, therefore, that if we could obtain trees of sufficient diameter, this property of resisting cracking or splitting, would render this soft timber applicable to numerous purposes in the mechanical arts; although, where greater strength and hardness is necessary, that of our native elm *(Ulmus campestris)* is preferable to every other.

XV. *Plane Family.*

We know as yet only three species of the plane hitherto described as natives of Asia.

1. One of these, the oriental plane, *(Platanus orientalis)*, figured by Du Hamel, grows freely under the requisite circumstances of soil and shelter in the valleys of Scotland. A fine specimen of the *P. orientalis* is in the Edinburgh Botanic Garden, about fifty feet in height, and of a proportionate circumference.

2. *P. cuneata*, or Wave-leaved Plane, grows much less freely, and in exposed situations scarcely attains the size of a tree.

3. The Maple-leaved or Spanish Plane, (*P. acerifolia*), grows equally freely with the first, and attains a greater height.

4. The American Plane, or Button-wood, (*P. occidentalis*, Catesb. Carol. t. 50.) which, on account of its superior hardness, chiefly deserves notice in this country, like the first mentioned species, requires a deep and moist soil, as on the banks of rivers, or inland lakes. The late General Washington measured a tree in an islet of the Ohio, which, at five feet from the ground, measured forty feet in circumference, giving a diameter of about thirteen feet. Michaux (T. André) measured one of still larger dimensions, and in full growth, affording an appearance in magnificence approaching to that of the oriental species, recorded by Pliny to have accommodated the Consul Licinius and eighteen of his suite with lodging during the night. The wood of the American plane, when dried, is of a dull red colour. It takes a fine polish, but being apt to warp, the use of it is confined to bed-posts, and similar articles of furniture. These trees are, from their rapid growth and fine aspect, highly ornamental in parks where the soil is not too thin and dry. In utility, however, the timber is inferior to that of the sugar maple.

XVI. *Elm Family.*

In utility, no tree can surpass our native Common Elm, *(Ulmus campestris*, Eng. Bot. 1886), numerous varieties of which have probably originated from the nature of the soil and general culture. It is rather unfortunate, that this, and the broad-leaved species *(U. montana)*, are easily propagated from layers, as a strong temptation is thereby afforded, to obtain plants speedily of a promising size at first, indeed; but, as in similar instances, with respect to forest trees in general, a miserable disappointment is experienced, a stinted race of dwarfs only being produced, instead of the tall magnificent progeny of nature. This species *(U. campestris)* is most accurately defined by Sir James Edward Smith in the Flora Britannica. The flowers are crowded, and nearly sessile, whereas our other native species, the Broad-leaved Elm, *(U. montana*, Eng. Bot. 1887), has the flowers lax and pedunculated. They may be distinguished at first sight, by the difference in the size of the leaves, those of the *U. montana* being much the largest. This last, we may remark, is the species most common in Scotland, and is sometimes called Scots Elm. Both are tough, and valuable as timber trees; but the *U. campestris* excels all the rest in tenacity, hardness and durability. We have mentioned

the timber of tupelo as excelling all other American timber in the indisposition to split, yet the tupelo affords only a soft wood; but to this invaluable property, the broad-leaved elm adds great strength. For the nave of wheels, it is therefore unequalled, as well as in various departments of naval architecture. Willdenow describes only seven species of elm. It is, however, scarcely to be conceived but others will yet be detected by the activity of botanists. The late Dr Roxburgh, in his admirable work on Coromandel Plants, describes one Asiatic species, the *U. integrifolia.* Willdenow describes only one American species, under the very improper designation of *U. americana;* but Michaux, to whom we are so much indebted, after a most extensive examination on the spot, has described three American species, two of which had been formerly confounded under one. Probably Humboldt may have observed others towards the southern parts of that immense continent. In the mean time, the white elm of North America, (*U. americana*, Mich.) from the surprising magnificence of its appearance, deserves the attention of every one interested in the ornamental branch of planting. Michaux the elder traced the most northern limits of this species under 48° 20′ N. lat. on the banks of the Mistassin, eighteen miles above its entrance into the lake St Jean; so that it would grow luxuriantly in our deep and fresh but sheltered valleys in the High-

lands, and south of Scotland, where the temperature during winter is much higher. It is singular, however, in the natural history of this elm, that Michaux the younger found it still thriving to the southward, towards the extremity of Georgia, a range of 400 leagues from north-east to south-east,—an important fact in the economy of plants, and affording the greatest encouragement towards the naturalization of foreign trees in this island. Between 42° and 46° N. lat. this elm attains the height of 80 and 100 feet, with a diameter of from 4 to 5 feet. Although, however, it partakes in a certain degree of the strength and tenacity of our common elm, yet it is certainly inferior to it in these invaluable properties. There is an elegant variety of this elm with pendulous flowers. But of the nine species now known, the *U. alata* of Michaux the elder is the most singular, although otherwise of no great value, the bark of the branches being furnished with lateral suberous productions.

XVII. *Lime Family.*

Of European lime trees, two are natives of Britain, *Tilia europæa*, Eng. Bot. 610. and *T. parvifolia*. Of the first, there are two or more varieties, of which the red-twigged is the most remarkable for beauty. Both species, when raised from the seed, will grow to the height of eighty feet on a

deep fresh soil. The more diminutive size of those commonly observed in this country, arises from their being transplanted at an advanced age, or from being reared from layers, or even cuttings. The *T. alba* of Willdenow was discovered by Kitaibel in great abundance in Hungary. The white lime-tree (*T. alba*) of the middle states of North America, is then probably a species distinct from that of Hungary, which Michaux the younger asserts to be the *T. heterophylla* of Ventenat, who has accurately described several of these trees in the fourth volume of the Memoirs of the Institute of France. The American species hitherto described are furnished with scales at the base of the petals, which in those of Europe are naked. All of them are highly ornamental.

The *T. americana*, Bunwood, or Broad-leaved Lime, (Vent. t. 2.,) in a deep and fresh soil, attains the height of eighty feet, whereas the *T. alba* and *T. pubescens* (Vent. t. 3.) do not attain the size of our own native species. This, then, is the only American species as yet known, that appears to merit attention in this country. Besides, the larger size of the leaves, and elegant pendulous flowers, would render it very ornamental on the lawn; and there is no doubt of its being sufficiently hardy, as it exists in greatest abundance in the neighbourhood of Lakes Ontario and Erie, and rather diminishes in frequency towards the south.

XVIII. *Ash Family.*

Of the fourteen species of the Ash enumerated and described by Willdenow, eight are included in the Kew Catalogue; and one of these (*Fraxinus excelsior*) is a native of Britain. The *F. simplicifolia*, or various-leaved ash, differs very much in habit from all the other known species, in possessing leaves, which, instead of being pinnated like the rest, are simple, and merely opposite. In the young plant, these leaves are trilobate, with very minute lateral leafets, which disappear in the adult plant, in which they become ovate and pointed, and deeply and unequally serrated. Although admitted as a species into the Kew Catalogue, on the authority of Willdenow, there is strong reasons to consider it as a variety only. Mr Macnab, Superintendant of the Botanic Garden of Edinburgh, informs us, that he sowed the seeds of the various-leaved ash some years ago, but that the plants produced possessed the pinnated leaves of the common British species, *F. excelsior*. The tree producing these seeds, in the Edinburgh Garden, is a fine specimen of the simple leaved ash, measuring upwards of fifty feet in height, although th soil is little better than sand. The tall and magnificent appearance of the common ash, the hardness, toughness, and great durability of its timber, are sufficiently appreciated; but this, like others of our native forest trees, has not es-

caped the mischief arising from the practice of raising a stinted progeny from it by layers, and even cuttings, although daily experience shews with what ease the seeds germinate, on dropping from the tree, without even a covering of earth.

The ash family is as yet but imperfectly known; but it is already sufficiently evident, from the structure of the parts of fructification, that the present genus includes several kindred groups. The European species differ from those of America; and these again are distinguishable from each other. The flowers in some have a calyx; others have the flower naked. Michaux the younger, whose admirable work we have had occasion so frequently to mention, supposes, that to the eastward of the Mississipi, including Canada and the United States, thirty species of ash at least exist,—double the number enumerated in the late work of Willdenow. But that we may not unnecessarily extend the present summary, the white ash, and some other pre-eminently useful species, only shall be noticed.

1. This fine tree, (*F. americana*, Mich. Arb. and Willd.) which is no less interesting from the magnificence of its growth than the beauty of its foliage, attaining the height of eighty feet, with about three feet in diameter, is found from the northward of the river Hudson to the southern limits of Jersey and Pennsylvania. It endures the severest cold of Nova Scotia and Canada, without any diminution of size. The name

of White Ash, originates from the whiteness of the bark. It thrives particularly on the deep and fresh soil on the banks of rivers or lakes, associated with the yellow birch, the elm, and black spruce. It occasionally rises perfectly straight, and without branching, to the height of forty feet. The designation, *F. discolor*, given to this species by Muhlemberg, is sufficiently appropriate, the leaves being white below, and of a fine bright green on the surface. The white ash unites all the good properties of our common ash, strength, toughness, and durability, and is used in America for similar purposes by the coach-maker and cartwright, and for many other purposes in the mechanical arts. Such of these trees as have already been planted in this country, grow freely in the deep fresh soils of our inland valleys.

2. The Red Ash (*F. tomentosa*, Mich. Arb.) acquired its name from the dark brown colour of the bark. This species, although attaining a far less height than the white, affords a timber of fine quality, and applicable to all the purposes of the former. The young shoots possess the peculiarity of being covered with fine hairs, from which arose the botanical designation. The natural range of this species extends less towards the north than the last.

3. The only other species we shall mention, is the Blue Ash, (*F. quadrangularis*), which belongs to that group whose flower is without a calyx. It

is found only in Kentucky and Genessee, under a climate of a most genial nature, the soil being moist and deep, and retaining that moisture which seems indispensable to the ash family in general. The term *F. quadrangularis*, is derived from angular productions formed on the bark of the young shoots, which disappear in the third or fourth year. This ash attains the height of sixty feet, and affords a timber possessing the good qualities of the rest. A blue dye is reported to be obtained from the bark of this species, but we are unacquainted with the process employed in obtaining it, which is probably analogous with that used in the preparation of indigo. It is to be desired that this subject may be soon investigated.

XIX. *Hornbeam* or *Ironwood Family.*

This family includes the two kindred genera *Carpinus* and *Ostrya*. The only species of Hornbeam, native of Britain, is,

1. The Common Hornbeam, (*C. betulus*, E. B. t. 2032), of which there are two varieties. Although Evelyn is perhaps too partial to this Hornbeam, yet, raised from seed, it forms a tree of the first rate, equalling the Common Beech in magnificence; but unfortunately the Hornbeam, like several of our best forest trees, may with ease,

almost at any period of the year, be propagated from layers, and the usual consequences of this practice, follow,—a stinted, bushy, dwarf-like progeny. This tree, however, retaining the decayed leaves during winter, like the Common Beech, forms most valuable shelter planted in hedges.

2. The American Hornbeam, (*C. americana*, Mich. Arb. F. p. 57.) is named Ironwood, from the close, compact, and unusual specific weight of the timber. Indeed the number of the concentric circles perceptible on a horizontal section of the trunk, or even branches, of a very small diameter, clearly shews the slow growth of this Hornbeam; and the utmost height it attains, scarcely extends to forty feet under the most favourable circumstances. The great strength of the timber, however, strongly induces us to recommend it to be planted in North Britain, especially as its geographical range includes Lower Canada and Nova Scotia, although extending southwards to the Middle States. The name *Bois à levier*, indicates the acknowledged strength of the timber, being used for levers in removing the trunks of other trees. Those planted by Duhamel on his estate in France, are at this moment thriving, some of them twenty feet high; and as they ripen their seeds, these might be easily obtained.

3. The only other species of Hornbeam, as yet known, is the *C. orientalis*, which of course grows much less freely than the last. This species was long ago introduced by Miller.

Of the *Ostrya* or Hop-hornbeam, two species are mentioned in the Kew list, *Ostrya vulgaris* of the South of Europe, with pendulous flower-spikes, and *O. virginica*, a species abounding in the Middle States of North America, having the spikes erect. It is to be observed, that Pursh asserts that Michaux's plate (Arb. For.) represents the Common and not the *O. virginica*, and that the spikes in the American species are invariably erect.

XX. *Hazel Family.*

Although our native species of Hazel, (*Corylus avellana*), is by some esteemed one of the most valuable of our forest-trees, very little attention has been paid to the rearing of it in Scotland. Of four varieties, almost the only one planted with us, is, 1. the common one, with small pale-coloured fruit, or White Filbert tree. 2. The Red Filbert, *Noisettier à fruit rouge;* and, 3. the Cob nut, with large round fruit, are scarcely known here; the greater part of our fruit being obtained from the common variety, which abounds in our woods, particularly in the Highlands. When raised from the seeds, this species attains the height of twenty-five, and occasionally above thirty feet. Marshal, however, reckons twenty feet as the average height of the Common Hazel; but this estimate is taken from those raised from

layers, or from old stems cut over and neglected in training. To have the excellent timber of our Hazel in perfection, it must be raised from seeds, and the best plants only allowed to remain, without transplantation. For stakes, and other agricultural purposes, however, and for hoops, nothing can equal the shoots obtained on cutting the stem near the ground. The varieties producing the finest fruit, are of course best cultivated from layers, and for this purpose, dwarfs are generally preferred; and Mr Neill informs us, that in Kent, plantations are made in this way for the supply of the London market with nuts. These plants are twelve feet asunder, and not allowed to grow above six or seven feet in height; and the branches trained in a concave form, as practised with the gooseberry *.

2. Lambert's nut-tree, *(C. tubulosa)*, although sufficiently hardy, is scarcely known in Scotland.

3. There are only two American species as yet ascertained; and of these, the *C. americana*, even abroad, forms only a shrub of eight feet in height; but as the fruit, according to Pursh, is excellent, it should be introduced into our shrubberies. The *C. rostrata*, the only other American species as yet described, is a still smaller shrub, and the fruit is not worth notice.

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* Vid. Article Horticulture, in the *Edinburgh Encyclopædia.*

4. The Byzantine Hazel, *(C. Colurna)*, is, even in its native country, but a tree of the fourth class, and, according to Marshall, only attaining the height of five feet in the South of England; but we owe to the late worthy Dr Hope, a specimen of this Hazel twenty-five feet high, in the Edinburgh Botanic Garden, Leith Walk. It seldom, however, bears fruit; but it affords an instance of the success with which trees of a far more genial climate, may under unfavourable circumstances be naturalised with us; the soil in which it grows, being a poor sand, and the situation originally much exposed. This species differs from the rest, in having a double calyx.

XXI. *The Æsculus Family.*

The Common Horse-chesnut-tree, *(Æ. hippocastanum*, Schm. Arb. t. 38.) has long ornamented the lawn in Scotland; and although originally from the North of Asia, grows occasionally to a tree of the second class, rising to the height of seventy or eighty feet. The elegant palmate form of the leaves, seven together, and the numerous and large spikes of white flowers streaked with yellow and rose colour, appearing early in June, are highly ornamental. One cause of this tree succeeding so well with us, arises from the buds luxuriantly shooting early in the season, and com-

pletely ripening the wood during the summer. The capsules, which ripen in autumn, ought to be dried as completely as possible, and the seeds sown the same year. The beauty, and not the value of the timber of this tree, which is soft, renders it an object of interest.

2. The *Æsculus ohioensis, (Æ. glabra?* Pursh,) of North America, is nearly allied to the first species; but as it is a tree of the fourth class only, and the value of the timber not superior to that of the last, it deserves little attention.

The genus *Pavia*, Buck's Eye of North America, possesses a close affinity with *Æsculus*; but the smooth capsule externally, not to mention other differences, both in habit and other parts of the fructification, would seem to justify the distinction of this genus from *Æsculus*. The tetrapetalous flowers arranged in spikes, and the five-palmated leaves, are however common to the whole of this family in America.

1. The *P. lutea*, (Mich. p. 238.; *Æsc. flava*, Willd.) is a fine tree of the second class, seldom attaining a height of more than seventy feet, and although the timber is soft, like that of the rest, deserves to be introduced into our lawns; the yellow colour of the spikes being very ornamental. If we might judge from its occasional associates under the same parallel (L. 39. n.) this species would succeed in the deeper soils of our

sheltered inland valleys. The *P. rubra*, (Mich. *Æsc. pavia*, H. K.) is a shrub only. Pursh, in his valuable Flora, has described two species of this family in addition to those of the Kew list.

XXII. *Laurel Family.*

There is something in the whole of this family, that renders them singularly pleasing; in many of them the leaves are evergreen, and in all, the stem, the leaves, the flowers and fruit, abound with certain volatile oils, peculiarly modified in each, but invariably fragrant. It is on account of this oil that they have long attracted the attention of mankind, and especially of physicians. The Cinnamon, and Cassia, and Camphor trees, so much valued in the East, are found within the tropics, and exist only in our stoves; but the hardier American and European Laurels, are well known in our shrubberies.

1. The Common Bay, *L. nobilis*, grows freely with us, especially when protected by more hardy associates, and in fresh and deep soils, rises to the height of twenty-five or thirty feet, and being evergreen, forms one of our most ornamental trees. In order, however, to attain this appearance, it must be raised from the seeds, and the young plants protected from the spring frosts during the two first years in the usual manner. In a

deep and moist soil, we have known the young shoots extend themselves eighteen or twenty inches during the season. The wood ripens, before the approach of winter. The fruit, which contains only a single seed, ought to be allowed to remain on the trees till December, and then be sowed in pots or baskets sunk into the ground.

2. The Carolina Laurel, or Red Bay, Catesb. Carol. t. 6. (*L. borbonia*, H. K. *Carolinensis*, Mich. and Pursh). This laurel is also evergreen, and possesses great beauty in its native country; and, if we may judge from some of its associates in the swamps of the Middle and Southern States of North America, it will withstand our winters in the deeper and sheltered valleys; abroad it attains the height of from sixty to seventy feet. The timber is close-grained, takes a fine polish, and becomes of a rose colour. The leaves are alternate, and the flowers axillary, and although small, are succeeded by oval fruit of a blue colour.

3. The Benzoin Laurel, (Commel. Hort. t. 97.) *L. benzoes*, is found in the Southern States of North America, and even in Canada. Ray mentions it as being cultivated by Bishop Compton in 1683 in England; but it has been little attended to in Scotland, although sufficiently hardy. The flower is small, and the fruit has not ripened so far as we know. This species requires a soil and treatment similar to the last. The leaves are

deciduous, but the scarlet fruit is very ornamental, and the whole plant partakes of that fragrance common to the family, and therefore certainly deserves to be planted in our shrubberies.

4. The Sassafras Laurel, (Trew. Ehret. t. 69. *L. sassafras*), like the last, is sufficiently hardy, as its geographical range extends from Florida to Canada. In the southern regions, according to Pursh, it is a tall tree, but of course diminishes in size towards the north, gradually becoming a mere straggling shrub. The leaves of this species are also deciduous, partly entire and partly lobed; but the whole plant partakes of that fragrance peculiar to the respective species, and affords, by means of boiling water, an infusion which is used among the people here instead of tea, when sweetened by the addition of sugar. It is the ligneous part of the root, however, that is preferred by the College of Edinburgh.

XXIII. *The Almond* or *Peach Family.*

The members of this, with those of the Cherry and Plum families, form so many groups of a kindred series of trees, possessing great beauty and utility, several of them affording timber of great value, and all of them bearing flowers, singularly ornamental, and frequently odorous, succeeded by the most wholesome and delicious fruit.

1. The Common Almond tree, (*Amygdalus communis*), of which we possess several varieties, is supposed to have been originally introduced from Africa, and long afterwards into Italy. The Almond tree was unknown in the time of Cato, when the fruit was termed "*nuces Græcæ*." The Almond, like the Walnut and Chesnut trees, requires only to be planted in a proper soil and sheltered situation, in order to ripen its fruit; but hitherto in Scotland it has had very little attention paid to it, although the fine rose-coloured flowers, which appear early in spring, alone highly entitle it to our regard as an ornament of the lawn. When planted against a north wall, so as to face the south, the fruit is no doubt sooner perfected, but the flowers are occasionally forced to expand too early in the season, and being thus blasted by the chilling spring winds, the chance of fruit, on the whole, is diminished. The varieties of the Tender Shelled, Sweet Jordan, and Bitter Almond, are propagated by budding on stocks raised from the seed of the Almond itself, or on such as are raised from the seeds of the Plum or Peach tree, according to the nature of the soil. The Almond tree raised from the seed, occasionally becomes a tree of the fourth class, seldom attaining a height of twenty or twenty-five feet.

2. The Dwarf Almond, (*A. pumila*), was long ago introduced into the Edinburgh Garden by Sutherland from Russia. This is a low shrub,

flowering in April, and is of course sufficiently hardy for the shrubbery in this country.

3. The Peach tree (*A. persica*) is cultivated only on account of the well known excellent fruit. Of the numerous varieties of this species, several ripen their fruit on the open wall in our most northern districts, as in Inverness-shire; the White and Red Magdalen varieties, towards the end of August. The Acton and Spring Grove Peaches, are likewise hardy varieties, which we owe to the ingenuity and judgment of Mr Wright. The peach tree has not hitherto been planted in the sheltered lawn; but the reason already stated with respect to the Almond tree, would seem to warrant a trial of the hardier varieties in the sheltered orchard or lawn, with the requisite attention to soil. At any rate, the exquisite beauty of the flowers, especially of the double variety, strongly recommend this practice, were it only for ornament. The fruit of the Nectarine, which appears in some respects so distinct from that of the peach-tree, is an accidental variety only; both occasionally occurring on the same tree. The great object with respect to both, then, is to obtain such as shoot freely, and whose shoots and fruit ripen early. The Elruge and Early Violet, on this account, highly merit our attention in Scotland.

XXIV. *Plum Family.*

Botanists, under *Prunus*, now reckon upwards of thirty species, of which, there are several kindred groupes more or less closely allied, for instance, the Apricot, the Plum, and the Cherry. The Apricot, *P. armeniaca*, is the most remarkable; and the delicate and highly flavoured fruit of several of them, rivals that of the Peach-tree. Of these, the Moorpark and Breda apricots, are generally esteemed, and ripen and produce abundant fruit, even so early as August, on the wall of the cottage or farm-house in various parts of our sheltered valleys. In fact, artificial heat renders the fruit mealy and insipid. The apricot-tree, when raised from the seed, grows like the peach-tree to a moderate height, being a tree of the fourth class only. When planted for fruit, they are generally rendered dwarfish by their mode of culture. When raised from the seed, therefore, they are best adapted for ornamenting the lawn, to which the beauty of their early flowers greatly contribute.

2. Of the proper plum-tree, (the *P. domestica*, Wild Plum, Eng. Bot. 1783.) and *P. insititia* or *Bullace Plum*, (841.,) and the *Sloe P. spinosa*, (842.) are the only species indigenous to Britain. The fruit of the two first, are agreeably cooling

and laxative; but the domestic Wild Plum is supposed to have produced gradually by culture those innumerable high flavoured and fine fruits, well known in all the temperate countries of Europe. This species, with training, rises to the height of a forest-tree of the third class; and the timber being closely grained and durable, is well known to the cabinet-maker. With this view, however, it must be raised from the seed only, and the offsets from the root carefully removed. The *P. insititia*, scarcely under any management, attains the size of the last species, and is equally disposed to produce offsets; but it is cultivated, especially in Clydesdale, on account of the fruit, which is preserved by means of sugar for domestic use. The *P. padus*, or Bird-Cherry, is a pretty shrub, growing to the size of the last; but the *Sloe*, (*P. spinosa*), is altogether unmanageable.

XXV. *The Cherry Family.*

The Cherry, although nearly related to the Plum family, is still sufficiently distinct in several respects. As forest-trees, various species of cherry are more valuable, although the fruit is less extensively useful, the taste being less easily preserved than that of the plum. The two native species, are very valuable on account of their timber, especially the Black Cherry or Guigne, (*P. cerasus*),

so much prized on account of the fine fruit. The Guigne, in the valleys of the Highlands, is a tree of the second class, very ornamental from the beauty of the flowers in spring; but the fruit, which is sweet and well flavoured, is generally devoured by birds. This tree affords timber of great value, the grain being fine, and equal to mahogany, for the various purposes of the cabinet-maker. The other species, or Red Cherry, (*P. avium*), also grows to the size of a timber tree, but is less frequently planted in Scotland than the last. The fruit is likewise useful, although not so good as that of the Guigne.

Of foreign species, 1. The Perfumed Cherry (*P. mahaleb*) is highly deserving of attention as an ornament of the park; the flower being agreeably odorous. There is a fine specimen of the Mahaleb in the Botanic Garden of Edinburgh, twenty-five feet in height.

2. The Portugal Laurel, as it is very improperly named, is the *P. lusitanica*, which forms one of our best evergreen trees, although liable to be blighted in exposed situations.

3. The Laurel Cherry, another evergreen, (*P. lauro-cerasus*), although originally from the Levant, ripens its seed when of sufficient age; and when raised from seed, and not stinted by propagation from cuttings, this species attains the height of a fourth rate tree by careful training. The leaves, bark, and indeed all parts of the plant,

are well known to be poisonous, although the leaves are injudiciously used in cooking. This poison is a volatile oil, analogous to that of the bitter almond: in fact, the seeds of the whole of this extensive series, contain this oil more or less.

4. The *P. caroliniana*, or as it is improperly named the Wild Orange-tree, is another evergreen species deserving our attention. In the Middle States of North America, it is highly ornamental, growing to forty feet in height; but in this country, it has hitherto appeared only as a shrub. As in the last species, the flower forms erect spikelets, shooting from the axils of the leaves. The fruit is black; but the pulp is green and insipid.

XXVI. *The Mulberry Family.*

The Black Mulberry *(Morus nigra)* has long been cultivated in this country. In favourable situations, it grows to the size of a tree of the third class, and ought to be more commonly planted on the lawn. When the fruit is the sole object, it is most readily obtained by grafting the young stock with a scion from a tree in a full bearing state. This is generally practised, but the method by approach, is recommended by the best authority. The leaves of this species are the common food of silk worms.

2. The White Mulberry *(M. alba)* occasionally appears in our shrubberies; and from the

delicate smoothness of the leaves, it would seem better adapted for the food of the silk worm than the last.

3. The Red Mulberry *(M. rubra)* of the Middle States of North America, ought at least to be tried in this country, as several of its associates in the forest have been successfully cultivated here. Like those of the black species, the leaves, being covered with hairs, are scarcely adapted to the rearing the silk worm; but, what is of greater importance, the Red Mulberry would be more useful as a forest tree. In Virginia, Pennsylvania, &c. it grows to the height of seventy feet, with a proportional diameter; and the timber which is finely grained, of a yellow colour, and very durable, is used for knees and in other parts of ship-building. The fruit, as the name implies, is of a red colour. The seeds might be easily obtained from New York or Philadelphia.

XXVII. *The Laburnum Family.*

This fine tree *(Cytisus laburnum)* is now so well known, as to require no description. It is one of the most useful as well as ornamental, of the numerous race to which it belongs; but it is necessary to preserve it from the treatment it generally receives both in Scotland and in the south. None who observe the miserably crooked and dwarfed state of most of these trees with us, would suppose

them to merit much attention; but were we to observe those originally reared from the seeds under proper treatment, we should be convinced of the importance of rearing the Laburnum, particularly the broad-leaved variety, as a forest tree in Scotland. The timber is indeed much prized for its hardness, beauty of grain, and durability, and is very valuable for the purposes of the turner and cabinet-maker. It thrives even on the poorest soil, ripening its numerous seeds in autumn. For the ornament of the lawn in spring, it is unrivalled, to which the large trifoliate full green leaves, and elegant pendulous yellow spikes, occasionally ten or twelve inches in length, equally contribute. Neither the Black Cytisus, nor any other of this family, so far as known, are in value equal to the Laburnum in size, the greater part of them being mere shrubs.

XXVIII. *The Robinia Family.*

We shall close the present summary of forest trees with the *Robinia pseud-acacia*. This tree is scarcely inferior in beauty, and in the value of the timber, is superior, to the Laburnum. The late Mr Cockburn of Ormiston, first planted this species as a forest tree in the park of Ormiston Hall in Haddingtonshire, where soil and situation were rather unfavourable. These now equal in height and diameter most of their native as-

sociates. The timber is close-grained, hard, and finely veined, and in America more valued by the cabinet-maker than any other native timber whatever. Pursh, in his late valuable Flora, asserts, that being nearly incorruptible, it is equally useful for posts and gates. We are informed by a friend, that gate-posts of this timber, on the property of Mr Howard, near Baltimore, have remained fresh for nearly a century. The finely pinnated leaves, and pendulous white odorous flowers, add greatly to the beauty of this species; the value of which is scarcely known in this country. The flowers, however, are very seldom produced.

2. The *R. glutinosa* is still less known here; and its tendency to send forth off-sets, forms a great objection to planting it.

3. The *R. hispida* is a shrub only, but of great beauty, and sufficiently hardy. The large rose-coloured flowers, render it well adapted to the shrubbery.

We shall conclude this part of our Report, with recapitulating generally what we conceive to be the principles that ought invariably to guide us in the

Rearing of Forest Trees.

It is observed by Lord Bacon, that "there is no "part of society, nor order of persons, which have "not some point of contrariety towards true know-

"ledge;—generally taking small light from "natural philosophy; they do but spin out their "own little threads; because," he adds "men "strive against themselves to save the credit of "ignorance *." The truth of these observations, is well illustrated by daily experience.

Since the time of Cook, one of the first writers on the subject of forest trees, and the celebrated and truly respectable Evelyn, of whose work, an edition, with the practical directions of Hanbury, and botanical descriptions of Miller, was lately published by Hunter of York; and since the publication of the excellent Dictionary of Miller, so much improved by Professor Martyn, there is, in the opinion of many, nothing further to be desired on this important part of rural economy; especially with the late useful works of Marshall, on Timber, Hedge-rows, Woodlands, &c. But this last writer, has copied all the errors as well as excellencies of his predecessors. These errors, indeed, are now so thoroughly established by prescription, that it is perhaps hopeless to attempt to eradicate them. Art has completely superseded nature in the common methods of rearing and cultivating forest trees. We shall, notwithstanding, venture to state a few obvious

* Interpret. Nat. xxvi. et Formul. Inquis.

truths; in the hope of their being useful to those whose good opinion we chiefly value.

I. Preservation of the Leading Root.

1. Forest trees, in order to attain their full perfection, should be raised from the seeds, and not from suckers, cuttings, or layers. The seeds of all plants, and more especially Dicotyledonous trees, at the moment of germinating, emit a leading root generally perpendicularly downwards, with lateral diverging radicles; and from this leading root, the future plant is at first chiefly nourished, the lateral diverging radicles being only subsidiary to this important purpose. The moment, however, that this main leading root is cut off or injured, an effort is made to supply its place by the lateral radicles enlarging and multiplying in a singular manner; nature exerting herself to supply the loss; and, under occasional fortunate circumstances, seeming partially to repair it; but in the forest, the unfortunate sufferer is inevitably stinted, overtopped, and choked, either by other plants, or by its more fortunate associates.

2. One great object, then, in the rearing of forest trees, is to prevent as far as possible this fatal accident; for experience shews, that when this important part is once destroyed, it is never

renewed, and its office, in general, but very imperfectly supplied by lateral shoots *.

3. Therefore, the common practice of REPEATEDLY TRANSPLANTING seedlings into what is termed the nursery, is necessarily injurious; the slender leading perpendicular root, being in ninety-nine cases of a hundred, partially or entirely broken off. The judicious practice of the late Earl of Haddington, keeping the whole of the root moist and entire, by immersing it in a tub, containing a mixture of earth and water, of the consistence of pap, cannot be too strongly inculcated on planters. But this cannot possibly be done, without transplanting immediately from the bed, into the situation where the trees are to remain; the leading root being otherwise necessarily injured, either by instantly withering, or by every subsequent removal †.

4. What is termed a tap root, then, is not confined to the oak, the hollies, and pines, or any

* Repeated experiments, in order to ascertain this important fact, have been made with the germinating seeds of plants, belonging to tribes widely distinct from each other; and the result was invariably as here stated.

† The Earl of Haddington's small but excellent summary, is now scarcely to be met with in the shops; although, being founded on upwards of thirty years observation, it is extremely valuable. "Every removal of a tree," says his Lordship, "checks "its growth; and if I could raise them all without transplanta-"tion, it would be a great advantage."

other particular tribe, but is in fact common (in some less prominently) to all tall plants; and seeing its destruction manifestly tends to the stinting and injuring their growth, let us carefully preserve it, as closely as possible following nature; and, after due preparation of the intended soil, sowing the seeds of the various forest trees, where they are intended to grow, either in the common method, or, where it can be executed by a drilling machine, at the requisite distance, for the young plantation will, in this way, admit of being easily cleared of weeds, and occasionally thinned, as the plants advance in size, in order to admit the necessary circulation of air, as well as to allow freedom to their respective roots*. The loss by the number of young trees thus sacrificed, is not by any means equal to what is sustained in the method commonly practised, by repeated failure in transplantation, &c. &c. and after all, producing a race of inferior trees. It is a well ascertained fact, that seedlings allowed to remain in their original station, will, in a few seasons, far over-top the common nursed plants several years older. The partial destruction of the larger seeds, of the Oak, Chestnut, and Walnut, by field mice, affords no satis-

* Under certain circumstances, various crops, as turnips, &c., may be raised in the intervals between the rows.

factory objection to the practice here recommended.

5. These principles, however, are of course applicable strictly to forest timber-trees. Where shelter or ornament is speedily wanted, where uncommon species or varieties are to be preserved, and where seeds cannot be obtained, transplanting of grown trees, laying, budding, inarching, and other means, must consequently be substituted.

II. Distance between the Young Plants.

6. It is evidently impossible to lay down determinate rules in a matter in which there are necessarily so many varying circumstances to be taken into account, that the practice must vary with them. The end in view, is to admit sufficient room for growth and circulation of air. But as various trees naturally differ in form, some extending their roots, as well as branches, farther in a horizontal direction than others, which point more perpendicularly upwards, there is necessarily a difference in the space required by different individuals. All that can be done then is, as much as possible to regulate the distance between them GENERALLY, according to the natural form of the respective trees: The Pines, Firs, and Larches, for instance, requir-

ing less distance between them than the Oaks and Ashes. We have already (4.) recommended sowing the seeds, where the trees are intended to grow, in preference to transplanting, especially in forming extensive plantations. The same principles would seem to point out the propriety of sowing thick. Nature scatters the germs of organized beings with invariable liberality. Millions perish; but the end is obtained,—the surface of the earth is covered. In general, even the coast of this island, now so bare and bleak, there is reason to conclude, formerly abounded with trees; but these were sown by nature herself, and they protected each other from the fury of the tempest. It is in vain, therefore, to expect success, but in following her steps, and at the same time profiting by experience. The great object then, is to sow sufficiently thick, and to remove the least valuable plants gradually, as circumstances point out, always allowing them to grow closer together in the most exposed situations.

III. Unnecessary Pruning.

An attention to the last objects (3. and 4.) would not by any means supersede the useful and necessary part of the business of professional seed merchants and planters, but would certainly lead them to adopt plans more useful to the public, and even-

tually more beneficial to themselves. The expences incurred by a strict adherence to these principles, would not surpass the amount of what is now squandered on

" Pruning the seedlings, &c.
" Putting them in.
" Pruning the nursery plants*," &c. &c.

" In pruning (says Marshall) seedlings, &c. the roots should not be left too long and sprawling; in this case, they should be trimmed off pretty close, so as to form a globular root. By this means," he adds, " new fibres will be formed immediately, and of course be *easily* removed with it, without disturbing the earth interwoven among them." This handsome " globular trimmed root," is no doubt " easier removed," and requires only a nice small globular hole to fit it, on planting; but the consequences are manifest.

Having thus trimmed the root, Mr Marshall proceeds; and, on the same erroneous principle, orders to be taken off the " awkward and defective tops, " which should in most cases be trimmed quite " close up to the leader, or be cut off a little above " the root." Now, convenience to the planter, is in fact, the only reason assumed for " trimming the

* Marshall on Planting and Rural Economy, vol. i. p. 25.

" root into a globular form;" but this close trimming of the top " is founded on a false notion; " by " reducing the tops," says Marshall, " the roots," —the trimmed roots, " are rendered better " able to send up a supply of sustenance to the part " left standing." It was never once imagined by these artists, that although the root sends upwards the recent sap, this sap was assimilated by the leaves; and would have been returned, and deposited in the form of young wood, in concentric circles around that of the foregoing year, by the vessels of the numerous important branches which they had ordered to be cut off, in order to form a " handsome top" at the expence of the future growth of the whole tree; and thus, in fact, all these prunings and trimmings, and transplantings, are worse than useless.

We shall now proceed to the fourth part of our Report, and give a brief notice of

IV. Plants recently acclimated in Scotland.

Edwardsia.

On perusing, some time since, the valuable remarks of R. A. Salisbury, Esq. of the Royal Society, on the necessity of reforming the Sophoræ of Linnæus, we could scarcely have imagined that two of the species would, in the course

of a few years, add to the beauty of our Scottish shrubbery; yet both have withstood for years the severest of our winters.

1. *E. microphylla.* This elegant plant, we owe, with many others, to Sir Joseph Banks, who discovered it in the island of New Zealand. In one garden near Edinburgh, it has already attained the height of eight feet, thoroughly ripening the summer shoots, and flowering early in May, retaining, during our severest winters, nearly in full verdure its truly elegant pinnated leaves, being planted against an open wall facing the west, by our late worthy colleague and Secretary, Mr Thomas Dickson*.

2. The *E. grandiflora, (Sophora tetraptera,* Curtis's Mag. 167.) is equally hardy, and has been exposed by Messrs Dicksons and Shankly of Leith Walk, to the utmost violence of the northern blast, at the expence of loosing its verdure. In this state, however, it bore its magnificent yellow flowers. These enterprising planters, have

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* Mr Dickson died in the month of May of the present year, (1817), of a painful illness, which he bore with great fortitude. He was not merely eminent as a Botanist, but excelled in the knowledge of the Testaceæ, and he possessed a small but very select collection of shells.

several other tender exotic shrubs under trial in the open air *.

3. The *E. chrysophylla*, the only other species described, we have not as yet obtained.

Sophora.

4. *S. japonica.* This plant, according to Mr John Welsh, a most industrious and skilful gardener, has withstood the utmost severity of several of our winters; but could scarcely be expected to flower until the roots have more fully extended themselves. The slender pinnated leaves resemble those of *Robinia caraganna* in size.

Medicago.

5. *M. arborea.* This fine shrub, when sufficiently rooted, thrives better in the shrubbery than in the green-house; and the same may be observed of *Coronilla glauca*, and *C. emerus*, and other kindred genera of the great leguminous race, to the successful cultivation of which a free exposure to the air is absolutely necessary. The *M. arborea* has stood several severe winters in a garden in the heart of Edinburgh.

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* Melaleuca hypericifolia; Melaleuca diosmæfolia; Metrosideros lanceolata; Banksia ericifolia; Clethra arborea; Olea europæa; Leptospermum lanigerum; Anthyllis barba Jovis Protea levisanus.

Pyrus.

6. *P. japonica.* This beautiful shrub grows freely in protected situations, and when trained against a wall with a good aspect, flowers in April and May. Nothing can excel the fine effect of the numerous scarlet flowers contrasted with the shining green of the foliage.

Pittosporum.

7. *P. tobira.* This is another native of Japan; which, in protected situations, has withstood several winters. The bark, however, is apt to split and decay near to the ground. The flowers are said by Kæmpfer to be agreeably odorous, and much valued in its native country.

Aucuba.

8. The *Aucuba japonica*, or *Golden plant* of Japan, has withstood for five or six years the severest of our winters. It grows freely, making strong shoots, and ripening them before the winter. The bright glossy green of the leaves, curiously spotted with yellow, has a fine effect in winter. This is likely to become one of the most magnificent of our evergreen shrubs. The flowers, however, seldom appear; at any rate they are small, and produce little effect.

Camellia.

9. *C. japonica.* This fine plant has already been exposed by Mr Macnab, in the front of the stove of the Botanic Garden, a situation perhaps more trying than in the sheltered lawn. This plant, with the *Thea*, with which it is closely connected, are, however, as yet only under trial. The high price demanded for the plants, has prevented us from obtaining a sufficient number for exposure. The *Camellia* preserves its fine shining leaves during the winter. It is the flower of this plant which is so frequently figured on the paper imported from China; and the numerous varieties in our green-houses, are the result of culture. The flowers are inodorous, but finely varied and large. The finer varieties are multiplied by inarching on the stock of the single flowered plant.

Liriodendron.

10. The *L. tulipifera*, or *Tulip-tree*, has long been introduced into the park in various parts of Scotland, where it annually produces its magnificent flowers. It has in some instances already attained the height of a tree of the third class, even when propagated from cuttings, but, that finer plants might be obtained from the seeds, is perfectly evident. The timber, however, is soft and spongy; but the bark, which is agreeably

bitter and aromatic, has been used in North America in the cure of intermittent fevers, and well deserves the attention of physicians, as a substitute for that of Cinchona. The planting of the tulip-tree, ought, therefore, to be extended.

Magnolia.

11. *M. grandiflora.* The observation of Michaux, " En Europe, le point le plus avancé vers le nord, où le Magnolia grandiflora passe bien l'hiver à plein terre, est près de Nantz," (L. 47° 13'.) would have almost deterred us from planting it in the neighbourhood of Edinburgh. It has, however, proved sufficiently hardy, retaining its large glossy pointed leaves, during our severest winters, and ripening the annual shoot under most unfavourable circumstances. The object, then, is to obtain seeds, and by sowing them, to acquire handsome and better-rooted plants. To the five deciduous species of *Magnolia,* Michaux has lately added the *M. macrophylla,* or Umbrella tree. The *Magnolias* will soon become more and more common in our shrubberies and lawns. The whole require a deep fresh soil, in order to succeed.

Kalmia.

12. The *Rhodoraceæ* have long afforded us the most elegant of our evergreen shrubs, especially several species of *Rhododendron,* such as *R. pon-*

ticum, and *R. maximum*. The *Kalmias*, although scarcely inferior in the beauty of their flowers and leaves, have been long neglected in this country. The *Kalmia* was first cultivated in Scotland by the Reverend Dr Stuart of Luss. But we owe by far the most promising plants of this interesting family to Mr Macnab of the Botanic Garden, who raised them from the seeds. They make slow but strong and vigorous shoots, and attain a taller and more erect appearance than the bushy stinted plants raised from cuttings.

The flowers in the *K. latifolia* are terminal; those of the *K. angustifolia*, are lateral; both are equally beautiful.

These plants require a fresh soil, but do not strike their roots deep. With us, the *Kalmias* have not hitherto attained a greater height than three or four feet.

Verbena.

13. *V. triphylla*. The stem of this plant has, during winter, hitherto died down to the soil; but the root, remaining, sends forth vigorous shoots in spring, growing, in some sheltered borders, to the height of three or four feet, and flowering in August and September. This shrub, in every part abounds with an odorous volatile oil like that of lemon-peel in flavour, which the leaves communicate, by a boiling heat, to milk, and other matters of diet. This oil is obtained, by

distillation with water, from the leaves and young shoots, in the same manner as that of peppermint, &c. The flowers are small and not showy. This plant, and the following, are natives of different parts of South America: this species was introduced into France by Thouin, to whom Europe is much indebted for the introduction of foreign ornamental plants.

Fuchsia.

14. *F. coccinea.* The stem of this truly elegant shrub, like that of the last, dies to the ground in winter, but shoots vigorously in the ensuing season, and, in warm situations, flowers in the end of July and in August. Some old bark is generally spread round the stem of these two last shrubs. Both have hitherto grown more freely in the open air than in the green-house. They require a deep fresh loam. From the seeds ripened in the open air, we shall probably soon have plants more likely to ripen their wood and preserve their stem, as well as the root, during our winters.

Corchorus.

15. *C. japonicus,* affords another instance of plants native of Japan, growing freely in the neighbourhood of Edinburgh. This shrub was first introduced from the conservatory into the shrubbery by Mr Macnab, who lately obtained a medal for his merit in this and other respects,

from this Society. This fine shrub is peculiarly ornamental; the numerous double yellow flowers appearing in April, and continuing during May. The shoots of the season, several feet long, ripen their wood, and flower the following year. In one part of the Botanic Garden, the plant is more than twelve feet high. It is disposed to send forth numerous offsets from the root, which afford abundance of plants.

To the present list, we shall, on a future occasion, have the honour to announce other ornamental plants new to the soil of Scotland, provided the Society should deem the further prosecution of experiments of this kind deserving of their attention.

XXXIV.

An easy and sure Method of raising Mushrooms, either with Dung or without it.

By Mr WILLIAM WALES, Gardener to Colonel DUFF at Fetteresso Castle.

(Read 11th March 1817.)

1. *How to procure the Spawn.*

FOR this purpose, the month of March is the fittest time, the cattle not being then upon grass, but chiefly upon dry food of one sort or other. Take two barrow-loads of cow-dung, one load of sheep and one of horse dung; dry them well; then break them quite small, so as they may go easily through a coarse garden sieve. When well mixed together, lay them up in a round heap, finishing at top in a point. It is to be understood,

that the operation is to be conducted in a dry shed. Observe to tread the heap as it is put up, which will greatly save it from heating too much. If a stick were thrust into the heap as a proof, and when taken out, if it feels very slightly warm in the hand, the heat is doing well; for in the whole mode of raising mushrooms, it should be particularly observed to take great care of the heat, as the mushrooms are impatient of either too much heat or cold: the best adapted and most productive heat, I have ever found, was from 55 to 60 degrees of Fahrenheit, and the nearer the beds are kept to this heat, the greater will be the success. The heap is to be covered with horse-litter, in a state of fermentation, to the thickness of four inches all over. If the shed be warm when the heap is put up, I would recommend old bass-mats rather than dung, as the least over-heat would spoil the heap. In this state, let it lie for one month; then throw the litter a little aside, thrust the hand into the heart of the heap, and take out a handful. If the spawn has begun to run, you will observe numerous small white fibres or threads through the dung. If not begun to run, let another covering be put on above the old one, of the same thickness as the first; and after a month more, you will undoubtedly find the heap to abound with spawn. I have had it running in three weeks, and sometimes it has required ten

weeks, much depending on the state of the dung. The spawn thus procured, is of the very best quality, far exceeding what is got in fields or in old hot-beds.—I write from experience, and have not borrowed this mode of procuring spawn from any one.

The spawn in this state, is not fit for keeping long; and I shall next give directions how to form spawn-bricks, when as many can be made at one time as will serve for the season, or even for a number of years if required, provided the spawn be kept dry.

2, *Making of Spawn-Bricks,*

Take of horse-dung without litter, three barrow-loads; two barrow-loads of the mould of rotten tree-leaves; two barrow-loads of cow-dung; one barrow-load of old tan-bark, such as is thrown out of the pine-pit; with one barrow-load of sheeps dung; mix all these well together, till the mixture seem to be one compost, and to be as fine and soft as common mortar, or as the clay used in grafting, as otherwise it will not come easily out of the mould. Then take a small frame, such as brick-makers use for moulding their bricks,—the size six inches long, four broad, and three deep. A portion of the mixture should then be

forced into the mould or frame, and the sides of the mould being a little wetted beforehand, the spawn-brick will easily come out without breaking. After the bricks have stood two hours or so, take a blunt or rounded dibble, and make three holes in the middle of each brick, an inch from each other, and about half through the brick; these holes are for receiving the spawn. I find it is the best way, to lay the bricks as they are made upon boards, that they may be carried out of doors in a good day to dry. The bricks should be rendered perfectly dry, as the least damp would spoil the spawn. They will often seem dry on the outside, while they continue wet in the inside. The best way to prove them, is to break a brick, and observe how dry it is in the inside. It is to be observed, that great care must be taken in the turning them upon the boards, for fear of breaking, they being very apt to go to pieces, till nearly fit for receiving spawn. When fit, they are firm, and quite dry on the outside: this happens in the course of three weeks, if the weather be dry and the bricks be rightly attended to. Now, take fresh horse-litter, which has been laid up in a heap to sweeten as when for hot-beds; lay a bottom course of this six inches thick, whereon to lay the bricks. The horse-litter which is to be prepared for covering the spawn-bricks, ought to be rank, because the drier and sweeter the heat, the spawn will

work the freer; and, as I stated before, if the weather be warm, the less covering will serve; also, if there be any heat in the old covering at the expiration of three weeks, add no more new covering. as the old will perfectly serve the end. Every hole in the bricks must next be filled quite close up with the spawn; and as the bricks are laid one upon another, the upper side of the brick, when laid, must also be covered with spawn: at the same time, observing, as the bricks are laid, to keep them as open between one another as possible, so as to let the heat and steam of the dung go through all parts of the heap. The heap is to be terminated at top by a single brick. When all are thus laid, place round the sides and top, six inches of the hot dung, which will soon raise a fine moderate heat; observing, that all this must be done in a shed, or where rain cannot enter to cool the dung. After two weeks, add three inches thick of additional fresh dung upon the old; this will renew the heat, and make it work forcibly for the space of two weeks more, when the litter may be taken off, and cleared all out from the spawn-bricks. Before the cover is taken off, it will be proper to lay a little of it aside, and take out a few of the bricks, to see whether the spawn has run all through each brick or not; if not, replace the bricks again, and the cover, and let them remain for ten days longer,

when they will be found to be, every one as it were a solid mass of spawn. They may be allowed to stand and dry for a few days in the heap: they are then to be laid up in some dry place, till wanted for use, where they will keep good for many years.

3. *Rearing of Mushrooms.*

Having given an account how to procure the spawn, which is the principal point, I shall next proceed to state how mushrooms are to be raised from the spawn with dung. I raise the mushrooms in boxes, hampers, or in short in any thing which will hold the dung and the soil together. These boxes or vessels, are placed in the back sheds of the hot-houses, or in any house whatever, where no damp nor frost can enter. There should be several boxes, a part only being filled at a time, so as to keep a rotation of them, and have mushrooms at all times ready for the table. I shall suppose three boxes to be filled at one time. Each box may be three feet long, one and a half broad, and seven inches in depth. Let each box be half filled with horse-dung from the stables, (the fresher the better, and if wet, to be dried for three or four days before it be put in the boxes): the dung is to be well beat down in the

boxes *. After the second or third day, if any heat has risen amongst the dung, it is then a fit time to spawn: break each spawn-brick into three parts as equal as possible: then lay the pieces, about four inches apart, upon the surface of the dung in the box: here they are to lie for six days, when it will probably be found, that the side of the spawn next to the dung, has begun to run in the dung below; then add one and a half inch of more fresh dung upon the top of the spawn in the box, and beat it down as formerly. In the course of a fortnight, the box will be ready to receive the mould on the top: this mould must be two and a half inches deep, well beat down with the back of a spade, and the surface made quite even. But before the box be earthed over, it will be proper to take up a little of the dung, as far down as near the bottom of the box, to see if the spawn

* Since this *paper* was read, I have found it very useful to add to every three barrow-loads of horse-dung, one of perfectly dry *cow-dung*, beat down to powder as it were, and well mixed among the horse-dung, after the horse-dung has lain under cover for four or five days to dry. The reason I tried the cow-dung dry, was, that I still found the horse-dung to have a strong damp, after having lain in the boxes for some time; but the cow-dung, when beat down to powder, has the effect to dry up this damp, and also to make the horse-dung lie in the box more compactly; and the more it is pressed down, the finer the spawn will run amongst it.

has run through the dung; if not, let the box stand uncarthed for some days longer; for, were it to be earthed before the spawn had run through the dung, there would be but a poor crop. In the space of five or six weeks, the mushrooms will begin to come up; if then, the mould seems dry, give a gentle watering, the water being slightly heated in any warm place before being applied. This watering will make the mushrooms start freely, and of a large size. I cut three myself, which weighed 18½ oz. from a box treated as above. The boxes will continue to produce for six weeks, and I have had them productive sometimes for two months, if duly attended to by giving a little water when dry, for they need neither light nor free air. I have had thirty-two pretty well-sized mushrooms in one cluster. If cut as button-mushrooms, each box will yield from 6 to 12 Scots pints, according to the season and other circumstances.

The plan now described, I prefer for yielding numbers of mushrooms, and where a great many are required; but when reared without dung, they are best flavoured. They are not then to be distinguished from those which grow naturally in the fields, but comparatively few are in this way produced.

4. *How to raise Mushrooms without Dung.*

Take a little straw, and lay it carefully in the bottom of the mushroom-box, about an inch thick, or rather more. Then take some of the spawn-bricks, and break them down, each brick into about ten pieces, and lay the fragments upon the straw, as close to each other as they will lie. Cover them up with mould, three and a half inches deep, and well pressed down. When the surface appears dry, give a little tepid water, as directed for the last way of raising them; but this method needs about double the quantity of water that the former does, owing to having no moisture in the bottom, while the other has the dung. The mushrooms will begin to start in a month or five weeks, sometimes sooner, sometimes later, according to the heat of the place where the boxes are situated. They do not rise so thick nor of so large size, nor do they continue to be produced so long, as in the other plan with dung.

5. *Mould or Compost.*

I shall now describe the kind of mould or compost most proper for mushrooms in the box way. Take a quantity of horse-dung from the stable-yard fresh, and for every layer of dung, six inches

in depth, lay three inches of fine earth from any light soil; these alternate layers may be repeated, till there be as much as will probably be wanted for the course of a year. After this mixture has lain about six months or so, the dung will be sufficiently rotten: it should then be well broken with a spade, and passed through a garden sieve. Two inches of this compost laid upon the top of the box, and well pressed down with the back of a spade, will be found to answer. It is to be understood, that the same compost made of the dung and earth, is used for going on the top of the beds formed with dung, as well as on those without it, observing to have it sifted fine and well dried, for if it be damp, the spawn would not run freely amongst it.

With respect to Mr Oldacre's mode of rearing mushrooms, I never saw nor heard of it, till questioned on the margin of the proof-sheet by the Secretary.

W. W.

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